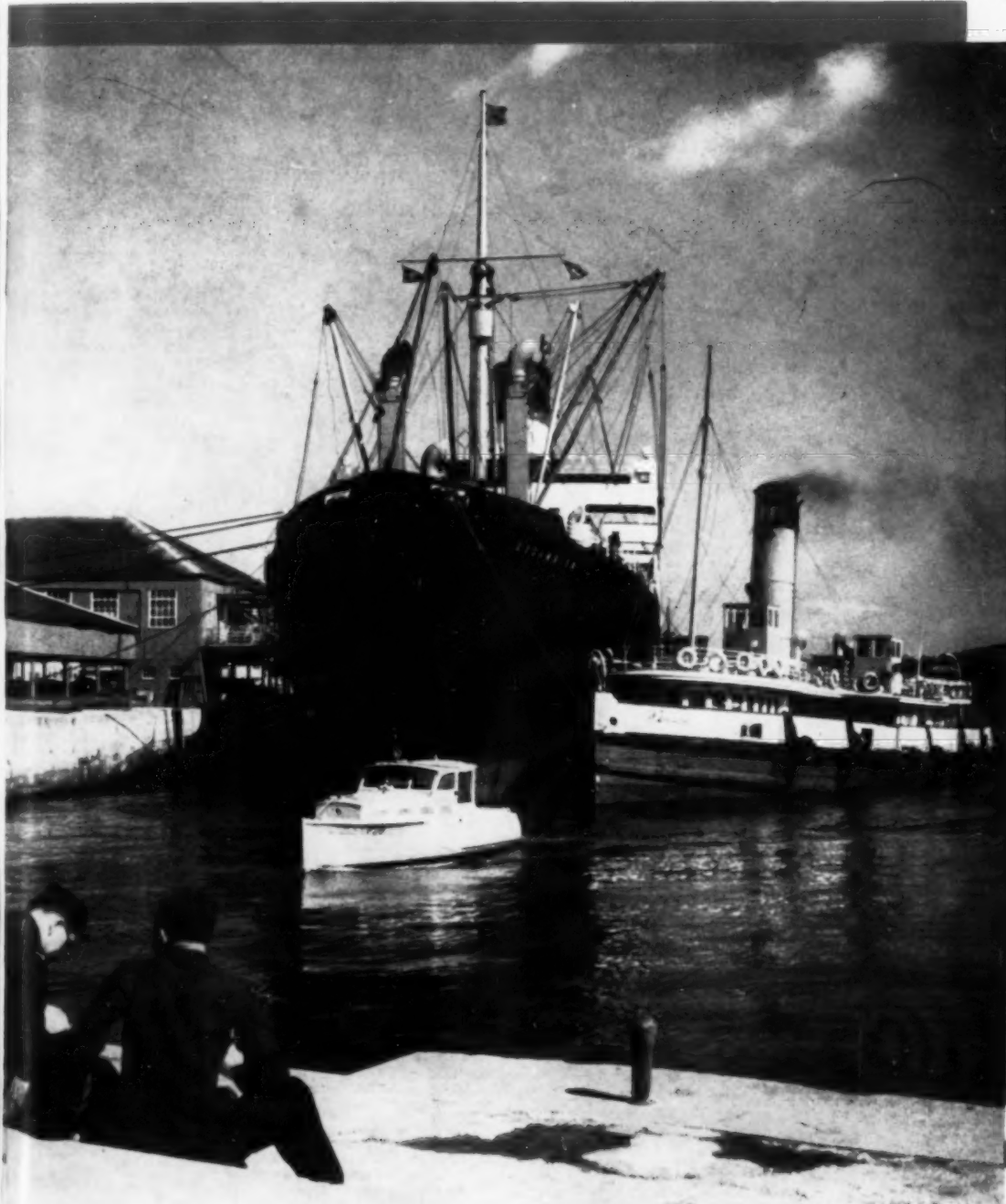


CANADIAN GEOGRAPHICAL JOURNAL

SEPTEMBER
1941

VOL. XXIII
NO. 3



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CANADIAN GEOGRAPHICAL JOURNAL

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Editor

Gordon M. Dallyn

This magazine is dedicated to the interpretation, in authentic and popular form, with extensive illustrations, of geography in its widest sense, first of Canada, then of the rest of the British Commonwealth, and other parts of the world in which Canada has special interest.

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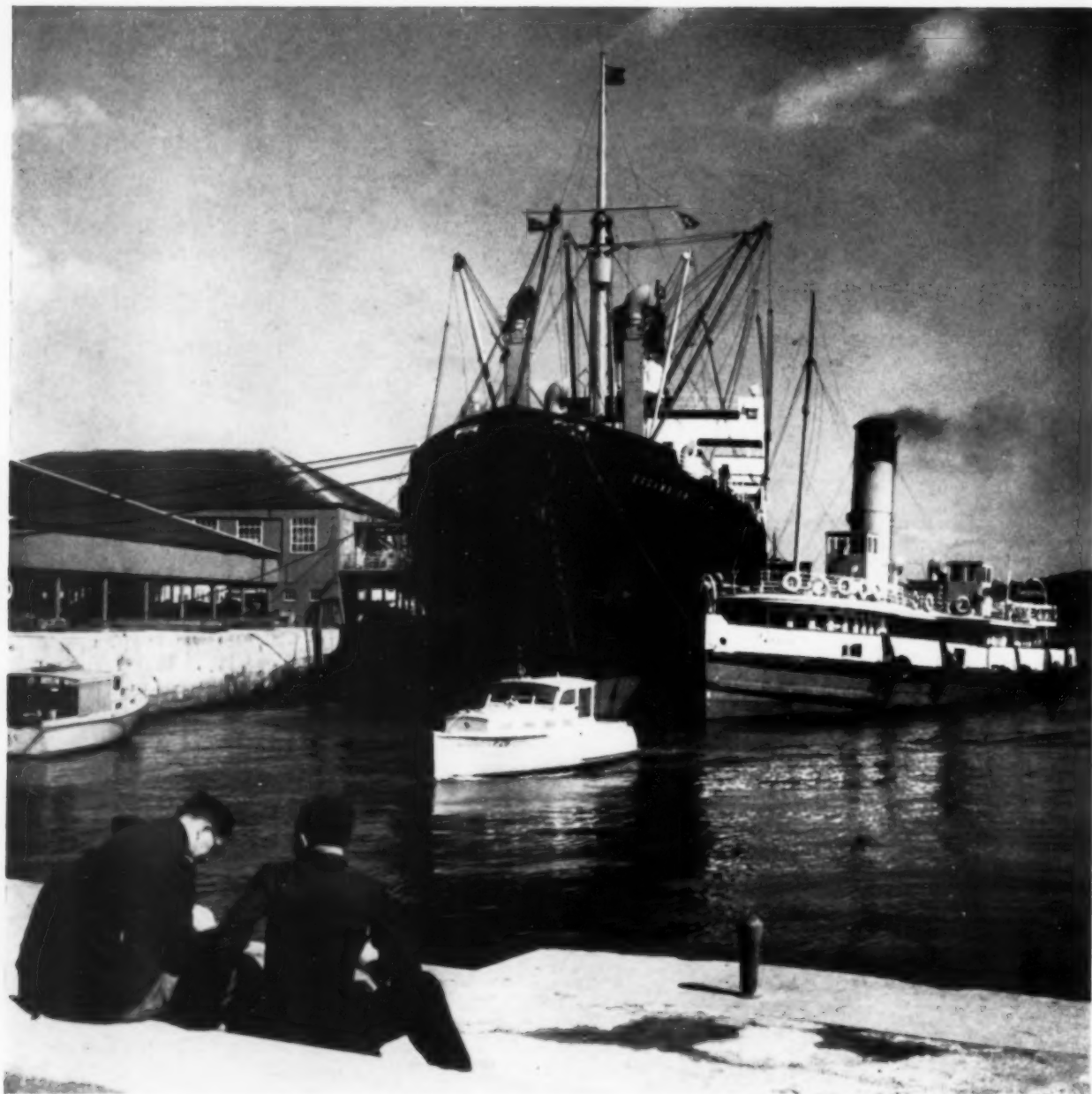
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Just in from Lisbon! The ships of the U. S. export lines call in at Bermuda once a week on their way to and from Portugal, as part of an agreement made with British Contraband Control and Censorship authorities. A British and a Canadian aviator can be seen sitting on the ferry steps in the foreground.

DEFENCE OUTPOST FOR NORTH AMERICA

—How Bermuda has become the Crossroads of the Atlantic—
by D. W. BUCHANAN

THE Bermuda Islands, those "fair Bermoothes", as the Elizabethans called them, have now become a mid-ocean crossroads between conflict in Europe and defence in America.

The leasing of certain areas in the colony for ninety-nine years by Great

Britain to Washington was announced last year. The Bermuda bases were a gift, not part of the contract regarding the transfer of destroyers. As Mr. Winston Churchill said in the House of Commons in August, 1940: "We have therefore decided spontaneously and without being asked or

offered any inducement to inform the Government of the United States that we would be glad to place such defence facilities at their disposal by leasing suitable sites . . . in all this line of thought we found ourselves in very close harmony with the Government of Canada . . .

On March first, 1941, the Stars and Stripes were formally raised over the newly surveyed United States naval bases on Morgan and Tucker's Islands in the Great Sound, which are two small cedar-clad strips of land located not far from the British admiralty dockyards. An advance contingent of American marines, in olive uniforms, and a bare-kneed bugle band of Bermudian volunteers formed the guard of honour as several British and United States officers—there was an admiral among them—took the salute. The first sod for the important defence works was turned by a red-tabbed English general. The bright spade he had in his hands, observers noted, was a new one marked "Made in Canada". It seemed to symbolize the interest of the Dominion in the proceedings.

Since the coming of the Americans, intense adjustments have had to be made in the local economy.

As it is only nineteen and one-half square miles in extent, and has been thickly settled for generations, the colony has never had much room for agriculture. Its exports have been limited mainly to a small quantity of fresh vegetables and lilies. Despite their beauty of gardens, of green cedars and oleanders in flower, few of its parishes can be classified as strictly rural. This makes the problems of resettlement, brought on by the establishment of the bases, particularly acute. The largest reserved area is in the far eastern corner. It comprises the waters of Castle Harbour, which was once a yachting paradise for millionaires, the adjacent Long Bird Island, and, finally, Cooper's Island and a large section of St. David's Island, where a unique race of farmers and fishermen dwell, who are descended from negro slaves, red Indian captives sent there from New England three centuries ago, and exiles shipped out by Cromwell.

A committee of the colonial legislature has found new homes for some two hundred and fifty of the St. David's Islanders, who had to be moved. On St. David's there

will also have to be much transplanting of lily fields, for the industry has been concentrated in that community and on the adjacent Cooper's Island.

Yet most of the colony remains untouched. For sixteen miles and more, the south shore of the main island should preserve its present beauty, its long open roads over windswept meadows, its patches of prickly pear and bay grape above the sands and breakers. The numerous golf courses also are not to be interfered with; there are six of them, several of championship nature and eighteen holes in length. How enough land for them was originally found, among the flower gardens and winding lanes of these crowded parishes, is puzzling. But found it was. Yet to-day other sports intrude. Baseball leagues are being formed, as there are going to be plenty of Americans to participate. These leagues plan to share, with the British sailors, the use of those football fields which were, years ago, with much expense and labour, levelled out of the irregular slopes of grass and cedar.

Economically, the inhabitants of the colony have been, until now, dependent almost entirely upon catering to tourists for a livelihood. The war naturally brought a diminution in the numbers of travellers. Passport regulations kept changing. Shipping services were curtailed; convoys



replaced luxury liners. Then, in the middle of 1940, two of the great hotels were turned over to the Imperial Censorship as offices and quarters for the nine hundred examiners of mail and contraband who were brought from Gibraltar and London to work in Hamilton, the capital. But many guest houses remained available. So, while the tourist trade may have faltered, it did not fail.

This year large numbers of Canadians and Americans have been visiting the green-clad islands. In one corner, there may be placidity, but, in another, there is sure to be excitement. The city of Hamilton, with its parades of soldiers and sailors from Canada, Great Britain and the United States, with its variety of shipping in the harbour and its variety of uniforms on the street, looks more cosmopolitan than ever before in its history. Also across the bay one large hotel remains open, the Belmont Manor, that houses everybody from aviators to famous diplomats and world travellers, all the persons whom war and the exigencies and occasional delays of Clipper communication across the Atlantic keep for a day or a week in this ocean halt between the continents. Its bars are almost as international as those in Lisbon to-day.

For a while Canadian soldiers, from Winnipeg, formed the Bermuda garrison; they were later replaced by a Scottish regiment. Should the Canadians return, the

attractive Maple Leaf Club, formed by the generosity of residents will be still available to them. It is now being used by the Highlanders.

The colonial government has sought for tourists recently from Canada and has obtained through an agreement with the Foreign Exchange Control Board in Ottawa permission for Canadians to come here freely on vacations. In various ways the people of the islands are closely allied with those of the Dominion. Some have been educated in the schools and colleges of Nova Scotia and Ontario. Now trade is forging other links. Boots and shoes marked "Made in Canada", are much in evidence, chocolates from Halifax, drugs from Toronto distributors, dry goods from Montreal and so on through a range of products. The merchants find it more and more difficult to obtain United States dollars for New York purchases, and shipments from England take a long time to arrive. So the Dominion benefits. The Canadian National Steamships convey the bulk of this commerce.

Figures recently released show that Canada was already, in 1940, second to the United States in trade with Bermuda. She replaced the United Kingdom which fell to third place. The total imports amounted to £1,469,504 of which Canada's share had by then become £334,168. During this same period, domestic exports from Bermuda amounted to only £22,707 — prin-

Yacht racing in the Great Sound, immediately in front of Morgan Island and Tucker's Island, where the Stars and Stripes were raised on March 1, 1941. The "mainland" can be seen rising up behind the area of the American naval base.



Why Bermuda is a mid-ocean centre of international travel. A scene at the airways terminal





A view of Castle Harbour. Here are the lily fields on St. David's Island, and in the middle background to the left is Cooper's Island. Most of this territory has now been turned over to the United States for ninety-nine years.

David Knudsen photos

Golf at Riddell's Bay. Behind is a panorama of the protected waters of the Great Sound, that has become now both a playground and a defence area.





C. N. R. photo
Canadian commerce arrives. One of the Canadian National steamers about to dock in Hamilton harbour



Defence activities do not interfere with the peaceful routines of the island fishermen. Here we see coloured fishermen pulling in their nets oblivious of the two pilot boats from U. S. destroyer which are moored at the dock beside them.



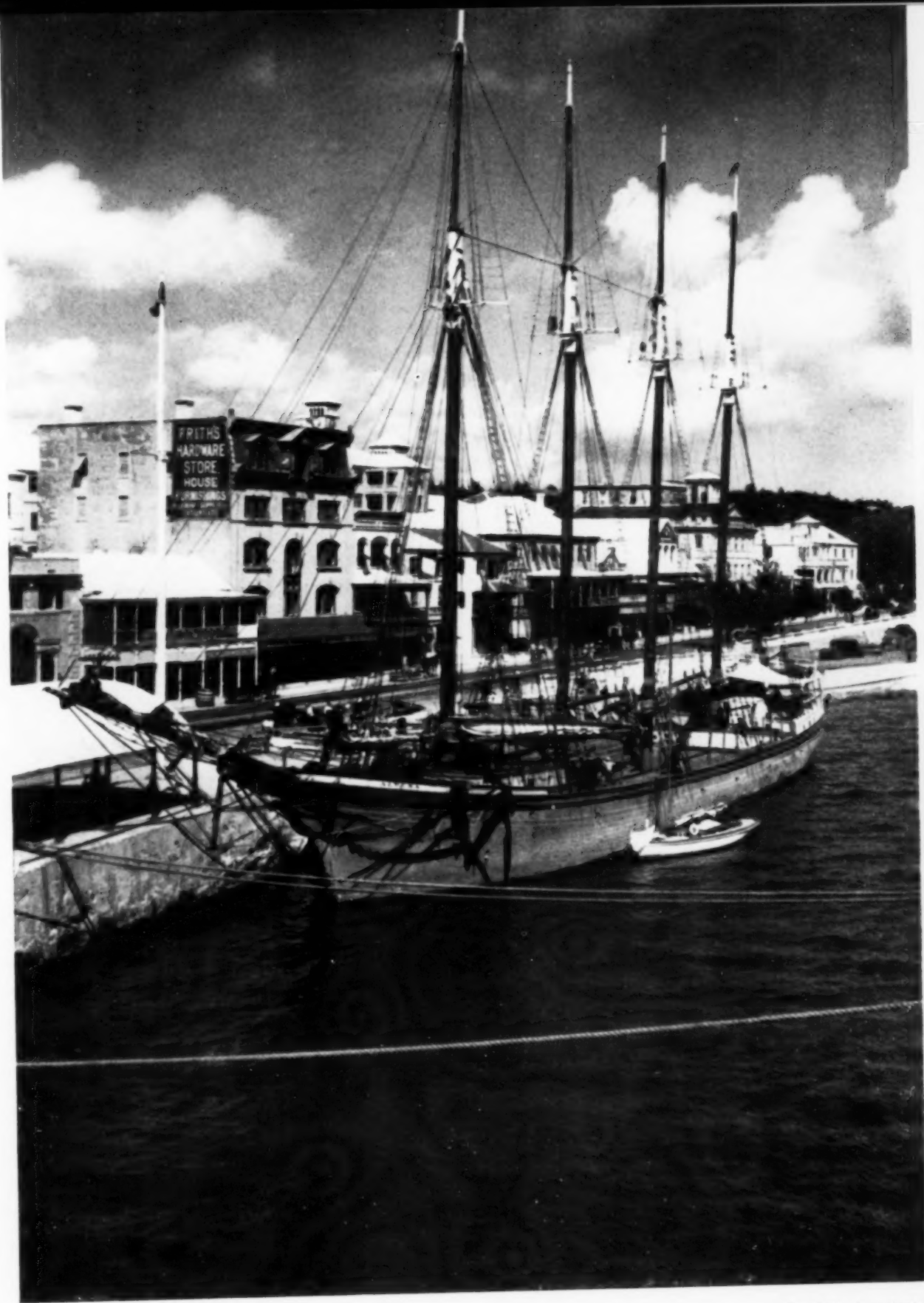
Every one took picture of the U. S. marines, that day in February, 1941, when they first landed in Bermuda. A scene on Front Street, Hamilton

cipally vegetables — of which Canada was the best customer.

This paucity of exports shows how attached the prosperity of the colony has been to the tourist traffic, and why its encouragement looms large in the minds of the inhabitants. Taxation, on the other hand, has not been much of a problem even in war years. It comes largely from customs duties. Also, because of convoys, the revenue of the government from pilotage dues has increased greatly. There are no income, inheritance or corporation taxes. Expenditures, of course, are not so great. There is, for example, no need to pay for the upkeep of expensive highways, as automobiles are restricted in number. There are several cars for the British forces and some ambulances, and the assembly also allows United States trucks and staff cars to be used in defence and construction operations. Also while education is compulsory, none of the thirty schools are really free. Negroes need pay only nominal fees, but it costs a white father sometimes as much as one hundred dollars a year to send a child to school.

Basic power in the government is held by the executive and legislative councils which are appointed, not elected. The colonial assembly, all the same, has considerable powers of debate, of revision, of initiation and refusal. But the franchise is limited. In order to cast a vote, you have to be not only a male British subject, but also the owner of a fair amount of property. A few women are agitating vigorously against these limitations. Also, the recent decision of the British Government to grant universal suffrage in Jamaica may have repercussions in Bermuda.

Out of a population of thirty-two thousand, about nineteen thousand persons are of coloured blood. There are also a number of Portuguese immigrants, mainly engaged in farming, or market gardening as it would more accurately be called in other countries. The identification cards, compulsory for all residents during the war, are, remarkably enough, printed in two languages, English and Portuguese. As for



Central Front Street, Hamilton, with one of the rare sailing vessels that still visit the Island

David Knudsen photo

the coloured folk, because of existing property qualifications, they do not have much representation in the assembly. They have, however, a well edited weekly newspaper which caters to their interests. Also this group now confidently expects a new era of higher wages. A construction boom is hoped for, and, among the labouring class, there is a stir of union activity in the air. A dockworkers' strike was recently settled to the advantage of the men. There is talk, too, of arbitration acts, of minimum wages and industrial compensation, while a delegation of workers this year sought advice from Sir Walter Citrine, the British trade union leader, during his visit to the islands.

Thousands of skilled mechanics and craftsmen from the United States are being brought in to help with the building of the bases. The United States Government also plans to ship in material free of duty, a concession which incidentally was strongly opposed by the Bermuda representatives at the time of the lease discussions in London. How much money and prosperity will come to the colony as a result of the establishment of the bases is, therefore, still pure conjecture and open to dispute. It may be considerable, but it probably will be less than expected. Certainly Uncle Sam is having houses and barracks erected by his own contractors, and he probably will feed most, if not all, of his skilled personnel in special dining rooms in the reserved areas. Three de luxe hotels have recently been leased to Washington authorities. The famous Castle Harbour hotel is an army barracks, much of the Elbow Beach is occupied by naval personnel, and the engineers are billeted in spacious quarters in a large hotel at the eastern end of the colony. The engineers are at St. George, an ancient town which has been in the doldrums ever since it ceased to be the centre of blockade running between England and the Confederacy during the civil war. Sleepy St. George, noted previously for its quaint but cramped streets and historic monuments, is now beginning to rub its eyes and awake.

As to the future, two schools of thought exist. One is the guardedly pessimistic, generally to be found among those whom outsiders would call the snobbishly inclined. These fear the end of the luxury trade. They calculate that while the influx of visitors may increase, the individual wealth

of each holiday seeker will be less. They are doubtless correct enough in believing that there are going to be more boarding houses and fewer grand hotels. They also wonder what will become of the yacht racing, if too many defence restrictions are placed on various inlets and bays. Yet yachting still continues during war time, and the graceful boats can be seen any holiday afternoon in the waters of the Great Sound.

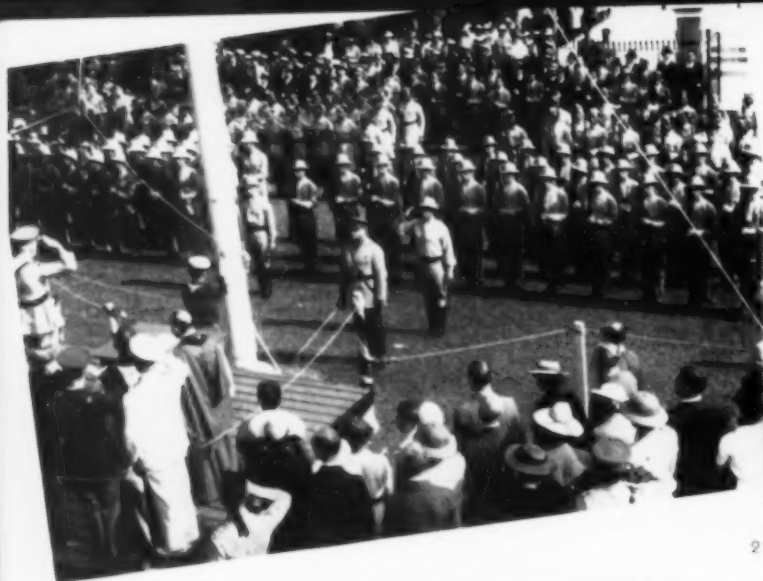
Considered in statistical terms, the population of the islands is going to be increased at least by twenty per cent, and this by citizens of the United States. May that not be the thin edge of the wedge to make Bermuda completely American? Some do believe this. But not so, reply the more realistic among the islanders. They explain that enough and to spare will remain untouched, as only four parishes out of ten will be affected by the bases. The busy British naval dockyard, it is added, has been active for generations, and it has not spoilt the beauty of the coral reefs and the green landscape; neither should the defence works of Uncle Sam mar the open vistas. The winding lanes between hibiscus blooms should continue to be the joy of pedestrians and the delight of those who ride bicycles.

Yes, Bermuda will remain a sub-tropical playground, but its social and economic life is going to change. Such adjustments are inevitable. The tourists are not forsaking it. They are welcome. But the great role of the colony for the moment is as a naval and military outpost for North America, for Canada and for the United States. Elsewhere on British territory, in the Atlantic and on the fringes of the Atlantic, wherever the new bases of Uncle Sam are being established, similar adjustments must be made. Yet in this small colony, every reaction, every change is magnified. If there are irritants, the irritants will be more visible here. Hence it is a tribute to the validity of Anglo-American co-operation that vexed Bermudian issues, such as the right, now verified, of the United States to have customs exemption in the base areas, are solved so quickly. Vested rights, colonial privileges, local prides can be and are being modified and moulded, so that nothing may interfere with the speedy development of hemisphere defence.



Air view of St. George, the narrow streets of which date back to the seventeenth century

David Knudsen photo



BERMUDA T

DEFENCE OUTPOST FO

(1) Section of parade on St. George's Day at which was inaugurated the campaign for the sale of Bermuda War Savings Certificates.

(2) Hon. William Beck, Consul General for the United States of America at Bermuda, with representatives of U. S. A. Naval and Air Base Commission

David Knudsen photo

(3) Oranges from the British West Indies are popular with the U. S. Navy.

(4) A U. S. A. "gob" photographs two new pals — a British Jack Tar and "Hieland" Tommy.



T O - D A Y

FOR NORTH AMERICA

(5) His Excellency, the Governor and Commander-in-Chief of Bermuda, cutting the first sod at the new U. S. A. air and naval base, Bermuda.

David Knudsen photo

(6) Parade of representative units of all defence forces in Bermuda

David Knudsen photo

(7) U. S. A. sailors enjoy the novelties of "navigation" ashore.

(8) The hoisting of the American flag for the first time, at the new U. S. A. naval base, Bermuda

David Knudsen photo





Photo 2. Outcrops of beds in the Buff Facies, Upper Ravenscrag, in a tributary coulee, near Keogh ranch buildings
Photo by H. Boyd

THE BIG MUDDY VALLEY OF SOUTHERN SASKATCHEWAN

by EDGAR HOULDSWORTH

UPON glancing for the first time at the title of this article, many readers will doubtless wonder "where exactly in southern Saskatchewan is the valley with this somewhat inelegant name?" The question is a pardonable one; for the writer can unhesitatingly assert, on the basis of many years' observation while residing in the province, that of the population in general, the number of those acquainted with the valley, or at least possessing knowledge of its whereabouts, is greatly exceeded by the number to whom its very existence is unknown. Consequently, it can safely be assumed that beyond the confines of the province, even the merest knowledge of the valley must be reduced almost to zero. Furthermore, published references to the valley are scarce, and appear to be confined to certain publications of the Geological Survey of Canada, in which they are very limited and of purely scientific import. This lack of publicity may be ascribed largely to three causes:

(1) ignorance of the existence of the valley,

(2) its somewhat isolated position, and
(3) the greater appeal of more popular and more imposing regions.

Despite this hitherto extremely meagre reputation, Big Muddy Valley possesses characteristics which justly entitle it to wider publicity in the future. However, it is not the purpose, and indeed it is impossible, to deal critically in the present short article with all phases of the valley's numerous features. Discussions, for instance, on the ornithology and modern botany of the valley; on the Indians, who in earlier days frequented the valley, and have left records and evidences of their occupation; on the settlements of white men of recent times; and on the outlaws and cattle rustlers, who during the closing years of the nineteenth century and early years of the twentieth infested the region, must be left to the attention of more competent observers. Furthermore, only brief comment can be made upon the most superficial aspects of the valley. The traveller, who, having become accustomed to the sameness of the view while journey-

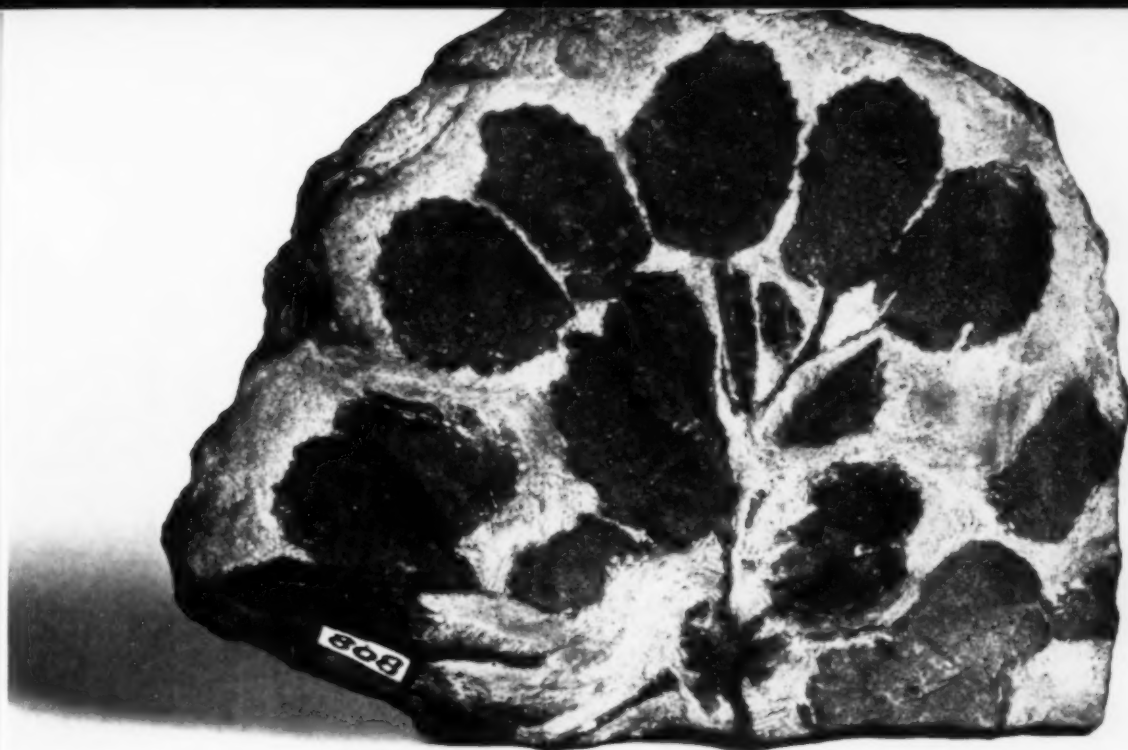


Photo 3. *Trapa (?) microphylla* Lesquereux. A problematical plant. Showing two fruits and part of the floating foliage, which, when complete, was in the form of a rosette (slightly larger than natural size).

Photo by Bird Films

ing across the apparently limitless prairie of southern Saskatchewan, experiences his initial sight of the valley, cannot fail to be profoundly impressed by the sudden change presented when the majesty of its proportions, combined with the very marked contrast which it affords to the treeless and somewhat monotonous rolling plains in which it is entrenched, becomes apparent. It cannot be called a mystery valley; but so deeply affected is the visitor with reverential respect when contemplating all that it signifies while descending into its depths, that he cannot avoid the sensation that he must be entering a strange and awesome region far removed from the commonplace country he has left but a few moments before. Having accustomed himself to the novelty of his surroundings, the visitor, on closer inspection, finds that everywhere are evidences of a diversity of subjects to delight the naturalist, and that there is an endless variety of attractive scenes for the artist and photographer. Finally — though for many this feature may hold no appeal — there is, pervading the whole valley, a sublime solitude and peace.

Having thus lightly drawn attention to a number of the features of the valley, it may now be stated that the express purpose to which this article is devoted is two-fold:

(1) to endeavour to arouse greater interest in a worthy but hitherto largely neglected section of southern Saskatchewan, and (2) to stress the importance of its least known, yet perhaps its most outstanding characteristic — its unquestionable right to rank as a highly significant, and at the same time practically virgin, field for the geological student and fossil collector.

General Description of the Big Muddy Valley

In the extreme south-central part of Saskatchewan lies an extensive tract of country, of which a considerable portion is occupied by an intricate system of deep and wide valleys and their tributaries. These valleys are entirely out of proportion to the few minute streams (when not dried up) which meander about their floors, and which obviously could have had no share in their formation. In fact, the whole system bears no relation whatever to the present system of drainage in the region, but consists of old abandoned water-courses which served as diversion valleys for, and indeed were excavated by, the vast floods of water which poured from the melting, and north-easterly retreating, margin of the ice-sheet which occupied the territory during the closing stages of the Glacial epoch. The system includes three major valleys, two of which unite to form

the third, and all of which follow broadly tortuous courses and are joined by many tributary valleys and coulees. The more northerly of the two confluent valleys — Lake of the Rivers Valley — heads far to the north in the country about Lake Johnston (some twenty-five miles south-west of the city of Moose Jaw), and follows, in the northern half of its length, a general southerly trend, and in its later half a south-easterly trend, while the more southerly — Twelve-mile Lake Valley — heads far to the west in the territory adjacent to the northern border of Wood Mountain Plateau, and follows a general south-easterly direction. The union of these two valleys occurs in the southern part of Township 4, Range 25, west of the Second Meridian, a few miles to the south-east of the town of Harptree, whence the third, or Big Muddy Valley, follows at first a slightly south-easterly direction, and then, by making a wide bend, changes to a southerly direction, which it maintains until it reaches the International Boundary at the south side of Township 1, Range 22, west of the Second Meridian. (The valley continues in Montana to the south until it joins the Missouri River Valley). Each of these major valleys is occupied in part by a long, narrow, saline lake of the same name, and a similar lake, named Willow-bunch, also is present in Lake of the Rivers Valley.

The excavation of Big Muddy Valley (and that also of the other two major valleys) resulted in the formation on either side of high steep walls composed of exposures of bedrock, and at the period of maximum excavation the depth was much greater than at the present time. At a later period, when the climate of the region appears to have been very humid and the run-off large, and long antedating the beginning of the semi-arid climate prevailing in modern time, the valley became filled to a great, though unknown, depth with alluvium. The surface of the alluvium is practically level, and forms the floor of the valley throughout its entire length and width. In addition to the filling of the bottom of the valley, slumping and downward creep of materials weathered from higher parts of the bordering cliffs resulted in the general development of grass-grown slopes along the valley sides. There are preserved, however, on both sides throughout its length, as well as along the sides of the tributary valleys and coulees, numerous hills and cliffs which

afford views of entirely bare outcrops of strata. Many of the hills, which at a distance appear to be isolated on the margins of the valleys, are really, for part of their height, joined by irregular platforms or ridges to the sloping walls of the valleys, while otherwise they are usually very uniformly conical (Photo 7). Frequently, the cliffs are very precipitous (Photo 1), and at times almost perpendicular, and, viewed from a distance, often appear to have adopted a variety of strange forms.

Big Muddy Lake, which is established on the alluvium of the valley bottom is very shallow, and has an irregular shape. Its north-western portion forms a long narrow arm, which occupies much of that part of the main valley which forms the wide southwardly-directed bend, to the southward of which, in Township 2, Range 22, west of the Second Meridian, the lake expands considerably. A narrow, tortuous arm extending in a general easterly direction from the north-eastern side of the expansion, occupies the entire floor of a long tributary valley. Southward from the enlarged part an arm extends for about three miles along the main valley.

The valley, from its western end to the International Boundary, has a length, including the numerous windings, of about thirty-five miles. The width at the bottom varies from one to one and a half miles, but owing to the upwardly receding character of the sides, this is increased to two miles or more at the prairie level. The depth averages 250 feet, but in places along the south side, and especially along both sides southward from Big Muddy Lake, the prairie level is at a height of probably 500 feet or more above the valley bottom (Photo 6).

Big Muddy Valley was first visited by the writer in the summer of 1906, when the whole region was almost destitute of inhabitants. At that time, and for many years subsequently, the appearance of the country, due to normal climatic conditions, was at its best, and was enhanced by Big Muddy Lake, which formed a large and attractive sheet of water, hemmed in by imposing walls of the valley. However, upon the advent of the severe and prolonged drought which began to afflict southern Saskatchewan some ten years ago, the water of the lake commenced to recede, a condition which persisted until, several years ago, it had entirely vanished. From that time to the present (1939) the lake-

THE BIG MUDDY VALLEY OF SOUTHERN SASKATCHEWAN

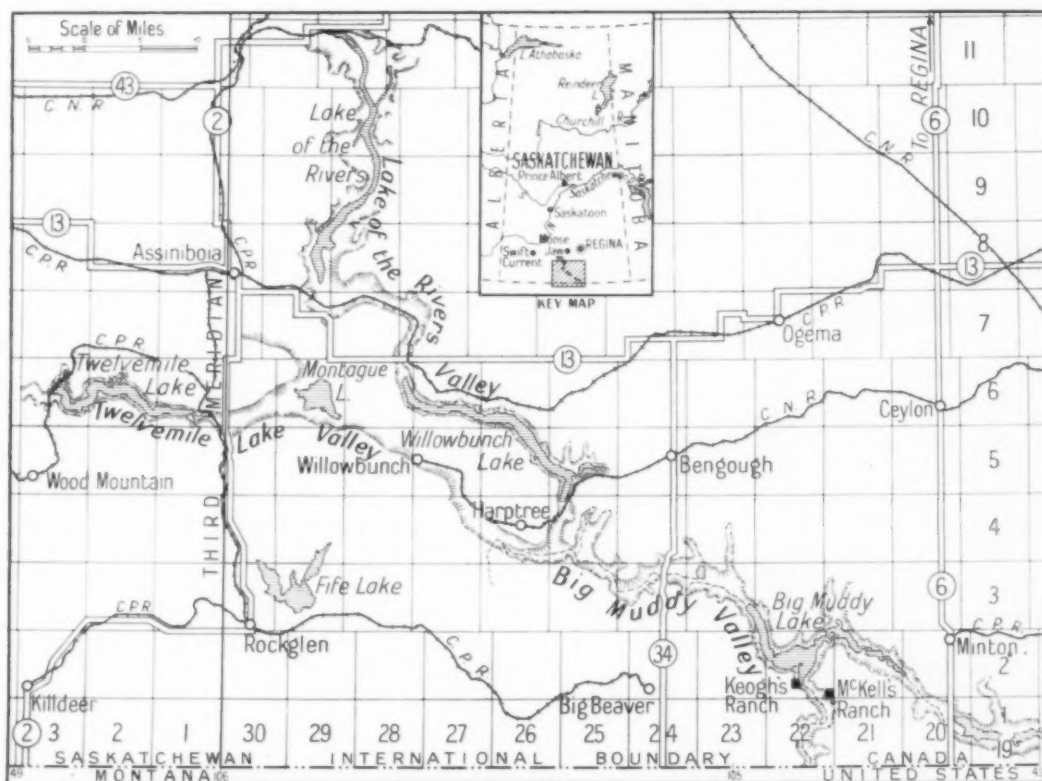
bed, white and alkaline, has remained a dreary waste.

The valley and the adjacent uplands, being adapted chiefly to ranching, are sparsely inhabited. The territory is traversed by only one highway, No. 34, which crosses the valley in a north and south direction about ten miles from its western end, and which extends to the International Boundary. There are no towns or villages situated in or close to the valley, and the nearest are small, being of just sufficient size to serve the needs of their immediate localities. Of these, Bengough is the largest, and is situated ten miles to the north of the valley on highway 34. Big Beaver lies ten miles to the south of the valley and two miles to the west of highway 34. Harptree is situated a few miles to the north-west of the western end of the valley, and Minton, which lies about five miles to the north-east of the eastern extremity of Big Muddy Lake, is also about twelve miles to the eastward of the main valley.

The statement previously made, that Big Muddy Valley is somewhat isolated, is not intended to imply that the valley

cannot be reached without considerable trouble, but rather to suggest that — excluding highway 34, which is not extensively patronized — it lies remote from the most frequently travelled highways. This, together with the fact that it is distantly situated from populous centres, largely accounts for its lack of popularity. The valley, however, can be reached conveniently by road from Regina by two routes, each of which terminates at a locality where occur fine views of its great proportions and rugged cliffs (Photos 1 to 8). By one of these routes, which passes southward over highway No. 6, westward over No. 13, and again southward over No. 34, the valley can be reached after a journey of 110 miles. The alternative route passes directly southward over highway No. 6 to the village of Minton, and thence south-westward by graded roads and prairie trails to McKell's ranch, which is situated on the east side of the main valley and near the south arm of Big Muddy Lake, and which is reached following a journey of about 115 miles.

At McKell's ranch, and also at Keogh's ranch, situated three miles to the north-



westward on the opposite side of the valley, occur comprehensive views of what are probably the most spectacular sections of the valley (Photos 1 to 6).

Physiographic History of the Region

In the preceding sections brief reference is made to the general surface character of the plains in the extreme south-central part of the province. It is of material interest to follow briefly the major causes which led to the establishment of the plains themselves. These form a relatively small portion of the plains of southern Saskatchewan, which, in turn, bear a similar relationship to the Great Plains of Western Canada.

As the physiographic history of the region dates back to early geological times, and as most of the evidence is buried deeply beyond hope of observation, it is obviously impossible to state from direct knowledge what was the sequence of events during the greater portion of the history. However, some idea of the alternation of conditions which prevailed during this portion can be inferred from information obtained in other parts of the Great Plains.

The Great Plains region lies between the Arctic Ocean on the north and the forty-ninth parallel on the south, and between the Cordilleran region on the west and the Canadian Shield on the east. It is established on a basement of Precambrian rocks, the surface of which, in the initial stage, formed a huge geosynclinal depression, the deepest part being on the western side. Very broadly considered, a general plan was followed in the structure, but as divergencies from the plan were numerous and varied in many sections of this vast region, and as many occurred at very remote distances from, and consequently with little or no influence upon, the region under discussion, it is necessary here to refer only to those

factors which had a more or less direct bearing upon its history.

Prior to the upheaval of the Rocky Mountains on the eastern border of the Cordilleran plateau at a late stage in the history of the plains region, the latter included the site of the mountains, and was bordered on the west by a highly elevated land-mass which occupied the site of the present mountain ranges immediately to the west of the Rocky Mountains. Thus enlarged, the surface of the Precambrian depression was occupied wholly or in part during the Palaeozoic era by a succession of seas, expansions and contractions of which were influenced by upward and downward oscillations of parts of their floors. These very ancient continental seas deposited sediments — derived chiefly from the western highlands — which ultimately became the strata that form the older parts of the structure underlying the plains. In this manner the Cambrian, the oldest of these formations, was developed, and is believed to have been restricted to the deeper western side of the geosynclinal. It was followed in succession by the Ordovician, Silurian, and Devonian formations, each of which, it is surmised, covered the entire region. It is not known to what extent the succeeding Carboniferous strata were developed, but during part of the period the sea is believed to have expanded eastward as far as the western side of southern Saskatchewan.

The Palaeozoic history of southern Saskatchewan, owing to the very deep burial of rocks of the era, is almost a closed book; the only direct evidence, obtained from four or five deep borings, being that Devonian rocks are present beneath a part (and probably the whole) of the region.

During the Mesozoic era, as in the Palaeozoic, there were repeated downward

Photo 3. Another view in the same coulée as in Photo 2. Lower beds to the left of the middle belong to the Grey Facies, Upper Ravenscrag; the higher beds to the Buff Facies.



Photo 4. Upper Ravenscrag beds in a coulée two miles west of Keogh ranch buildings

Photos by H. Boyd



and upward crustal movements in the Great Plains region, which resulted respectively in invasions by the sea, and in its partial expulsion, with accompanying development of continental conditions in the uncovered sections. Throughout the first, or Triassic period, the old Palaeozoic surface, except for the presence of a narrow sea on the western border, was probably exposed. During succeeding Jurassic time, alternate sinking and rising of the crust in the eastern part of the region resulted in great expansions of the sea in the first and last epochs, and a considerable retreat of the sea to the westward in the middle epoch. Both marine expansions spread their sediments as far east as Manitoba, while in the middle epoch, during the time of uplift, non-marine or freshwater deposits were made in the eastern area, including a broad eastern section of southern Saskatchewan. Lower Cretaceous time saw much irregular invasion of the region by marine waters, these at times being very extensive, and, during at least one stage, reaching into Manitoba.

The Mesozoic history of southern Saskatchewan to the close of Lower Cretaceous time also is almost unknown, the only source of information being the previously mentioned deep borings, from which it was found that Jurassic and Lower Cretaceous beds are present.

One of the greatest of marine invasions of the site of the Great Plains occurred in Upper Cretaceous time. The sea varied considerably in extent, and probably reached its maximum expansion in the early part of the period, when it stretched, at least over a major portion of the region, between the eastern and western extremities. Later, a considerable uplift in the west caused the restriction of the sea to the eastern section. This was followed by

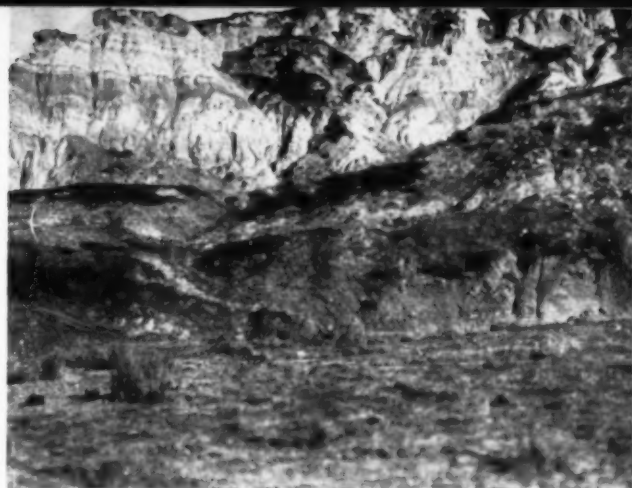


Photo 1. Cliff in a coulée at McKell's ranch, Buff Facies, Upper Ravenscrag

Photo by F. Bradshaw

a sinking in the west, and the expansion of the sea once more nearly to the same degree as previously. Finally, toward the close of the period, a continuous uplift, with the greatest elevation occurring in the west, slowly expelled the sea from the entire region, which from that time onwards has remained free from marine invasions.

The sediments of the Upper Cretaceous sea consisted of vast quantities of muds, ultimately consolidated into shales, and some sands, and in the eastern section, where marine deposition was practically continuous throughout the occupation, reached great thickness; three thousand feet or more being laid down in southern Saskatchewan.

Coincident with the gradual expulsion of the sea, river systems, flowing from the west, took possession of the rising floor, and in their estuaries, adjacent low-lying marshy areas, and in shallow lakes, deposited vast quantities of clays and sands brought from the highlands on the western border. There was thus a gradual transition from marine to continental conditions; the latter ultimately being established in all parts of the region. Such conditions

Photo 5. Outcrop of Upper Ravenscrag in the same coulée as in Photo 4

Photo by H. Boyd



Photo 7. Conical hill, about one mile east of highway 34, south side of Big Muddy Valley, and eleven miles south of Bengough. Basal beds belong to the Whitemud, all those above to the Grey Facies of the Upper Ravenscrag.

Photo by W. Shevkenek





Photo 6. The junction of the coulée of Photos 2 and 3 with the main valley, about half a mile to the left of the Keogh ranch buildings (middle). Dried up bed of Big Muddy Lake in the middle and left distances

Photo by W. Shevchenko

continued to the close of the period, when the Upper Cretaceous aspects of the Great Plains came to an end. During the development of continental conditions, vegetation spread over the region, and was sufficiently prolific and persistent in some sections, where other factors were favourable, as to be the origin of seams of coal now found intercalated amongst the strata. It was during this time, and under these changing conditions, that the Eastend, Whitemud, and Lower Ravenscrag formations of southern Saskatchewan were developed.

During the earliest or Palæocene epoch of the Tertiary, the first period of the Cenozoic era, there occurred in some sections of the Great Plains region, differential and progressive sinking of the crust, which, persisting for a long time, developed depressions in the surface, in which sediments, similar to, and derived from the same source as those laid down during the closing stages of the Cretaceous, accumulated in great thicknesses. Sedimentation, however, was not everywhere continuous, for at various times coal seams, similar in origin to those already mentioned, were added to the strata in several sections of the region. All such deposits as these were made over a large portion of southern Saskatchewan, and constitute the Upper Ravenscrag formation.

A momentous event, which profoundly

influenced the later history of the Great Plains, was enacted at the close of Palæocene time. This was the gradual upheaval of the Rocky Mountains on the western border of the region. Through its influence the rivers were greatly rejuvenated, and they transported from the rising mountains vast quantities of detritus, the types of which differed from those previously carried to the plains. This work went forward, though not continuously, and not over all sections of the region, through Eocene, Oligocene, and Miocene times.

The later history of the region, to the close of the Pliocene, was one of uplift, cessation of deposition, and consequent erosion of the surface. Erosion was rapid and extensive; in southern Saskatchewan operating to the degree that relatively small areas, now standing as erosion plateaux, are practically all that remains of the once widespread Cretaceous-Tertiary freshwater formations.

The final event of major importance in the history of the Great Plains occurred during succeeding Pleistocene time, the first epoch of the Quaternary period. At the beginning of the epoch, following a general cooling of the climate in all parts of the world toward the end of the Pliocene, frigid conditions developed over several vast regions. Amongst these, more than half of North America, including Canada and a large northern section of the United States, was affected, and



Photo 8. Cliffs and conical hill in the same locality as Photo 7. A section of the main valley is shown in the right distance.

Photo by W. Shevkenek

gradually became occupied by ice-sheets; practically the whole region being covered at the time of maximum glaciation. There were two main ice-sheets, the Cordilleran and the Laurentide, both of which originated from centres in Canada; the former in the west and confined to the Cordilleran mountainous region, and the latter in the remaining territory to the east.

The Laurentide ice-sheet radiated from three chief centres: one in Keewatin, west of Hudson Bay; another to the south-west of Hudson Bay; and a third in Labrador. The Keewatin sheet covered the Great Plains, and over southern Saskatchewan travelled generally in a south-westerly direction, reaching the limit of its expansion a short distance beyond the International Boundary.

In all glaciated areas, the ice margin, due to variations of climate, made many advances and recessions, some of the latter being of long duration, during which animals and plants occupied the uncovered sections. These interglacial stages are not fully known in southern Saskatchewan, but in one locality, beds formed during interglacial times have been found separating three beds of glacially deposited materials.¹

The Keewatin ice-sheet, travelling over a region of plains, could gather its load

of débris only from the ground beneath. Thence it transported granites, gneisses, schists, etc. from the Canadian Shield; limestones, dolomites, and sandstones from the exposed Palæozoic areas of northern Manitoba and northern Saskatchewan; and shales and sandstones from Cretaceous and Tertiary areas in Manitoba and Saskatchewan.

The ice-sheet, during its initial advance south-westward, first encountered the old eroded surface, from which it gathered soil and rotten rock. These were easily removed, and later, boulders and smaller fragments from deeper fresh rocks were transported. These drift materials, further reduced during their entombment in the ice, were released ultimately under varying circumstances, chiefly through the melting of the ice-margin, and were deposited in the form of boulder clay or till, boulders, sand, gravel, and rock-flour over practically the whole of the province. The deposits were irregular and of variable thickness, being dependent on advances, recessions, halts, and melting of the margin. During certain periods, when the margin neither advanced nor retreated, except within short distances, great piles of drift accumulated along the front, forming terminal moraines. Several such moraines were developed in southern Saskatchewan, the largest and

(1) Johnston, W. A. and Wickenden, R. T. D. — *Moraines and Glacial Lakes in Southern Saskatchewan and Southern Alberta, Canada*. Trans. Roy. Soc. Can. Vol. 25, Sec. 4, 1931, page 31.

most imposing being the Coteau moraine (Missouri Coteau), which was formed when, for a long time, the ice-margin rested against the eastern-facing escarpment of the most easterly of the old Cretaceous-Tertiary plateaux. Other deposits of drift were made, chiefly by sedimentation in temporary lakes in front of the ice-margin, and as ground moraines. In southern Saskatchewan the drift varies in thickness from nothing in two small areas² to a maximum of 500 feet or more in some localities³.

During the final withdrawal of the ice-sheet from southern Saskatchewan, great trenches, such as the Big Muddy Valley, were excavated by the enormous quantities of water pouring from the melting margin, and, during temporary halts, lakes (now extinct) were formed in which stratified beds of drift were deposited. Such a lake was glacial Lake Regina, the waters of which were held up when the ice-margin made a temporary halt, some forty or fifty miles to the eastward of the Coteau moraine, and developed what is known as the Moose Mountain moraine. (It is of interest to mention here that No. 6 highway passes southward for many miles over the bed of this extinct lake, and that during the journey from Regina to the Big Muddy Valley, it affords an impressive view of the Coteau moraine over which it eventually passes.)

It has been suggested that the final withdrawal of the Laurentide ice-sheet from the Great Plains began some 40,000 years ago⁴. From this it is reasonable to assume that about 30,000 years have elapsed since southern Saskatchewan finally was released from the ice. The early part of this time was doubtless very humid, evidence of which, as already pointed out with regard to the Big Muddy Valley, is afforded by the great thickness of alluvium filling the bottoms of large abandoned valleys, and by the development of younger and smaller valleys; as in such places as the bed of glacial Lake Regina. Many of these newer valleys, upon the advent of the semi-arid climate now prevailing, were also abandoned, or at any rate their streams became so meagre as to be quite out of proportion to their size.

The removal of the weight of ice resulted in differential uplift of the crust in Saskatchewan, as in other regions. This, no doubt, had some, though probably not an extensive, influence on the development

of the surface features. Of the uplift and its effects, however, little as yet has been discovered in the province, beyond the fact that the maximum rise was generally toward the north.

The subsequent history of southern Saskatchewan has been one of erosion of the surface, which, however, has undergone relatively little change since the inauguration of the semi-arid climate which now prevails.

A matter pertinent to the final completion of the Great Plains — and therefore to the region which forms the title of this article — relates to their occupation by man. He is believed originally to have entered America from Asia by way of Bering Strait; one route followed into the interior of the continent probably being along a wide territory, eastward of the Rocky Mountains, which may have been free from ice in late glacial time, and was certainly free from it in early post-glacial time. That man first entered the continent in one or other of these periods is very probable, in view of the fact that his wanderings early led him into all parts; even into South America, where evidences of his presence have been found in association with the remains of extinct post-glacial mammals. These early invaders brought with them the Old World art of making stone implements, which gradually became established far and wide, and must have persisted from the time of its introduction until it was displaced by the modern weapons and tools of white men.

Rocks and Fossils

Before proceeding to mention the rocks and fossils of the region under discussion, it is perhaps advisable to consider briefly the general significance which attaches to these interesting objects.

It has become almost trite in recent times to liken the rocks of the earth's crust to a book, of which some of the leaves are lost while some are partly destroyed. Yet it is true that, in the final analysis, knowledge of the earth's history is gleaned from the rocks. In them is written a long story of profound interest, one which, although expressed in a silent language of Nature's own, is perfect and reliable when understood.

Despite the fact that many causes have operated to destroy or obscure parts of the record during the immense length of time represented by the rocks of the earth's

(2) *Ibid.*, p. 39.

(3) *Ibid.*, p. 31.

(4) Johnston, W. A. — *The American Aborigines*, Edited by Diamond Jenness, University of Toronto Press, 1933, p. 44.

crust, a vast, though relatively small, knowledge of the history has accumulated since the inauguration, some 150 years ago, of a systematic interpretation of such parts of the record as are decipherable. This work, the result of the devoted efforts of innumerable individuals in all parts of the world, constantly goes forward, and, with the passage of years, all additional facts, however insignificant some may appear to be, are of importance to the history.

It is evident, therefore, that in the rocks of the earth's crust records exist of events, which, when correctly and orderly interpreted, reveal a profoundly impressive story. Of course, only that part of the history is available which is present in the accessible rocks, for the earlier records lie hidden in depths beyond the reach of man.

While investigations into the purely physical characters of all known rocks of the crust have been productive of a vast accumulation of knowledge, the character which has proved to be of greatest significance to the record is that which throws light on the succession of changes in the types and assemblages of animals and plants which inhabited the earth during various stages of its geological history, and which, moreover, affords the only reliable evidence relating to the succession of periods represented by the rocks. This, of course, refers to the fossils of the stratified rocks. It should be mentioned, however, that in many parts of the world occur rocks — some stratified and others of igneous and metamorphic origin — which are devoid of fossils, but of which many, by the application of other methods of investigation, contribute their quota of information to the record.

No rock-lore then, is so productive of historical value as that which is afforded by the fossil remains of organisms preserved in the stratified rocks. These relics occur in more or less profusion in most rocks of this kind, whether of marine or continental (freshwater) origin, and the search for them is excelled in interest by no other line of discovery. The ardent collector, to whom it is a privilege to uncover and handle these mute but eloquent records of the life of ancient times, is ever impressed by them and by the problems to which they give rise. To reflect upon the objects themselves, the conditions under which they lived, their associations, the causes of death, the manner of entombment, the state of preservation, and, indeed, many

other matters of interest pertaining to them, is surely an enlightenment worthy of attainment. Furthermore, the zest to add variety to the collection, to secure the best possible specimens, and, above all, to discover something entirely "new", brings to the work of the collector an unequalled and never-failing fascination.

Southern Saskatchewan affords ample scope for geological investigation. The accessible rocks are varied both in type and origin, and consist essentially of stratified kinds, several of which are highly fossiliferous. As already explained, there is, underlying the surface, a vast series of marine and continental formations⁵, which total thousands of feet in thickness, and which, individually, represent several geological ages, and collectively, the lapse of an enormous length of time. Only the highest beds of the entire series are exposed, the outcrops occurring in numerous places, but mostly along the sides of many stream valleys and of old abandoned water-courses such as have been described. The rocks exposed, according to the localities in which they occur, may be of marine or continental origin, or both.

In the Big Muddy Valley the outcropping formations are of continental origin, and represent portions of the Upper Cretaceous and Tertiary periods. The exposures are numerous, occurring on hill-sides and cliffs along both sides of the main valley throughout its entire length, and also along the sides of the numerous tributary valleys and ravines. The lowest and oldest of the visible beds represent the Whitemud formation, exposures of which occur on both sides of the valley eastward from its western end to where the formation finally dips downwards below lake level about two miles beyond the western end of Big Muddy Lake. The final stage of the Cretaceous period apparently is not represented in the valley⁶, though a series of beds of this age, the Lower Ravenscrag, succeeds the Whitemud far to the westward. Succeeding the Whitemud in the Big Muddy Valley, a series of beds, represented either entirely or in part on both sides of the valley throughout its length, forms the Upper Ravenscrag formation. This formation, which, in some localities reaches a maximum thickness of 500 feet or more, and includes many coal seams, has been divided into two series, the lower of which is known as the Grey Facies, and the upper as the Buff Facies⁷.

(5) *Geology of Southern Saskatchewan*. Mem. 176 Geol. Sur. Can. 1935

(6) *Ibid.*, pp. 40, 41.

(7) *Ibid.*, p. 45.

Erosion has removed from a large part of the region the higher beds of the Buff Facies, but they are preserved in a high upland area on the south side of the valley east of highway 34, and also on each side of the valley southward from Big Muddy Lake to the International Boundary.

Eocene and Oligocene beds were not formed in the Big Muddy region, and it was not until Miocene time that sediments, consisting mostly of quartzite sands and gravels, were transported from the Rocky Mountains and deposited here upon the Upper Ravenscrag. Although only one very small remnant of this bed is known in the area, occurring at the summit of a hill about half a mile to the north of the Keogh ranch buildings, it is possible that it may also occur beneath the drift in the highest uplands. At the Keogh outcrop the writer found a few, very small, obscure, and water-worn fragments of bones, which obviously had been transported and deposited with the gravel.

A very thin deposit of glacial drift rests upon the surface of the Upper Ravenscrag in the region, and, if the Miocene gravel is more widespread than at present known, also upon the surface of that formation.

No more than passing mention can be made here of the numerous types of rock encountered at the outcrops. They include sands (all the sands are feldspathic⁸, except in the Miocene bed), sandy clays, clays, shales, bentonitic clays and shales, silts, volcanic ash, bands of clay-ironstone in places, and, in addition in the Upper Ravenscrag, numerous intercalated seams of coal (lignite), which vary in thickness up to eleven feet. The variety of colours exhibited by the beds on weathered surfaces at some exposures is very striking, and may include white, sombre grey, greenish grey, yellowish green, yellow, buff, cream, and the black or dark brown of the coal seams. Bentonitic clays, smooth and soapy to the touch, are common, and in some places along the valley sides, mud-springs, composed of this material mixed with underground water, are interesting phenomena. The valley also is well supplied with springs of water, most of which are of excellent quality, providing a plentiful supply for stock and ordinary purposes, and flowing continually throughout the year; even defying the severe western winter temperatures and the drought of recent years.

Another interesting feature frequently encountered in the rock exposures is the occurrence of beds of burned clay. These,

generally red or pink in colour, but sometimes cream or buff, were produced when beds of coal, having become ignited by some means or other, continued to burn slowly in all directions, and, at the same time, caused the fusion of the beds of clay immediately overlying them. The cause of ignition of the coal seams is not definitely known, though the most probable agent was lightning. This, if responsible, might of course operate in a similar manner nowadays, but there is no evidence that such fires have been started during modern times in Tertiary coal beds in any part of southern Saskatchewan. In that region, the destruction of most, if not all, of such coal seams by fire occurred during pre-glacial or interglacial time, or both. This was proved many years ago by the writer by the discovery of fragments of fused clay, identical in characters with that found in the Big Muddy Valley, in glacial drift in several areas in the central parts of the province, notably near Radville, east of the eastern escarpment of the Missouri Coteau (Coteau moraine), and on the Coteau itself. The fused materials, part of the drift débris, were transported to these localities by ice-sheets from outcrops of bedrock situated in some region or regions to the north-eastward. These outcrops, or remnants of them, if any are still preserved, must now be buried beneath the mantle of drift which covers those regions, for none is known to be exposed in that direction.

All the beds from the base of the visible portion of the Whitemud to the highest elevation in the Buff Facies of the Upper Ravenscrag, carry more or less numerous fossils. These are exceedingly abundant in many instances, and, in fact, the whole valley — already referred to as being practically a virgin field for exploration — may be classed as a veritable storehouse for such remains. The relatively small amount of collecting done up to the present time has yielded remains of both animals and plants. The former include shells of freshwater invertebrates, fragments of the carapaces of species of turtles, bones of other reptiles, and scales and bones of fishes⁹. However, by far the richest yield of the rocks consists of the remains of plants, which in most instances are beautifully preserved. These, which represent many species, and in some beds occur in countless myriads, include leaves, fruits, stems, and fragments of trunks and branches of trees¹⁰.

(8) Ibid., p. 45.

(9) Ibid., p. 52.

(10) The rocks have yielded four genera of Conifers including *Sequoia* (Redwood), *Taxodium* (Bald Cypress), *Glyptostrobus* (now indigenous only to China, where it is known as the water-pine) and *Thuja* (Arbor Vitae). Specimens of fragments of "sprays" of the last three are figured, those of *Sequoia* being omitted owing to their poor condition.

Mention of these objects suggests the advisability of a short discussion of the conditions under which the organisms they represent "lived and had their being". These conditions were essentially similar during both the Cretaceous and Tertiary divisions of the period with which this article is chiefly concerned, but were entirely different from those prevailing at the present day.

The luxuriance of the vegetation — which at various times in parts of the area was so prolific and dense as to occasion ultimately the development of extensive coal seams — suggests that the climate was warm, and that there was an abundance of moisture. It was a warm-temperate climate; perhaps not unlike that now prevailing in certain southern states of U. S. A., including Georgia and Florida. Other physiographic evidences indicate that the surface was occupied by small open-water shallow lakes and great swamps and marshes, all separated by gently-elevated uplands. These, together with such a climate as described, could not be otherwise than immensely favourable to the growth of vegetation, which consequently was varied both in kind and habitat. Thus, in shallow open water thrived such plants as water-lilies and cat-tails; on the borders of swamps and rivers certain ferns; in denser marshes various kinds of magnolias and sycamores; and on the uplands oaks, walnuts, beeches, viburnums, figs, and grapes. These represent but a portion of the plants, for in their respective habitats were many others, including conifers — Redwood (*Sequoia*), Arbor Vitae or Cedar (*Thuja*), Bald Cypress (*Taxodium*), and another water-pine (*Glyptostrobus*) — and several kinds not represented amongst modern flora.

In such surroundings, and in such a climate, it is not surprising that inverte-



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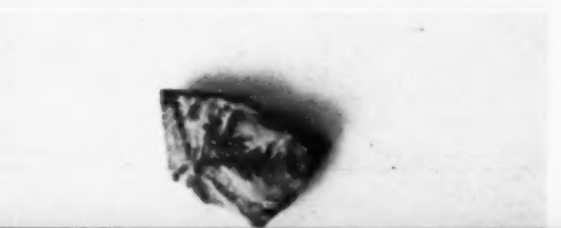
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Photo 11. *Taxodium dubium* (Sternberg) Heer. A species of bald cypress (about one-third natural size)

Photo 12. *Taxodium occidentale* Newberry. A species of bald cypress (about one-third natural size)

Photo 13. *Glyptostrobus europaeus* (?) (Brongniart) Heer (?) (natural size)

Photo 14. *Glyptostrobus europaeus* (?) (Brongniart) Heer (?) (about one-sixth natural size)

Photo 15. *Thuja interrupta* Newberry. A species of arbor vitae (nearly one-third natural size)

Photos 11, 12, 14, 15 by W. Shevkenek
Photo 13 by the late J. R. C. Honeyman



Photo 9. *Equisetum* sp. A species of horsetail or scouring-rush. Fragment of the rootstock with branches bearing "tubers" (about one-third natural size)



Photo 16. This leaf, allied to the beech family, is doubtfully referred to the genus *Castanea* (nearly one-third natural size).

Photos by W. Shevchenko

brates thrived, especially in the waters, and that certain kinds of reptiles were numerous. It might also be expected that such conditions would provide an ideal habitat for birds and butterflies. However, the remains of these creatures, if present, were difficult to preserve in the fossil state, and none has been found; the only instance known to the writer being his own discovery of numerous minute larvae of lepidopterous insects attached to a few fragments of leaves.

Evidence from the region to the westward of Big Muddy Valley shows that amongst the reptiles which thrived in southern Saskatchewan during the Cretaceous stage of the period under discussion, were dinosaurs, the remains of which have been found in the Lower Ravenscrag of the region. The presence of dinosaur remains in this formation and their absence from the Upper Ravenscrag, coincides with the world-wide extermination of many faunal types at the close of the Cretaceous, both on land and in the seas. Curiously, terrestrial invertebrates and vegetation were little affected by the catastrophe, but many marine invertebrate types and certain marine and terrestrial vertebrates were completely destroyed.

During the whole of the Mesozoic era reptiles were the dominant type of animal, and it was amongst these that the greatest extermination occurred. Although certain kinds, including turtles, crocodiles, and lizards survived, many were destroyed, including swimming reptiles (plesiosaurs

and mosasaurs), all flying reptiles (pterosaurs), and all dinosaurs.

The beginning of the Cenozoic era witnessed the gradual spread of mammals — which had previously been relatively insignificant in the world — until they assumed the dominant place in the animal kingdom.

Thus the mammals replaced the reptiles in importance in the world. Also is explained the reason for the absence of dinosaur remains from the Upper Ravenscrag of southern Saskatchewan. It is unfortunate that mammal remains have not yet been discovered in the formation, but they have been found abundantly in beds of similar age in Wyoming to the west.

As the essential purpose here is to bring prominently to notice the fossil possibilities of the strata of the Big Muddy Valley, it is unnecessary to do more than refer to a small selection of representative specimens. This is done by means of photographs of floral remains from both divisions of the Upper Ravenscrag, and by such descriptive notes as are necessary. All the photographs are original and represent fossils collected by the writer. The actual ages of the specimens range between fifty-five and fifty million years, these numbers being close approximations respectively to the time that has elapsed since the beginning and the close of the Palæocene epoch.

A New Discovery in the Big Muddy Valley

The thrill felt by the collector upon

finding something "new" is exemplified by the experience of the writer in connection with the discovery of several specimens of *Trapa* (?) *microphylla* (Photo 23) in the Big Muddy Valley. These were collected from a bed near the top of the Grey Facies of the Upper Ravenscrag, the outcrop occurring on the side of the hill (previously mentioned as being topped by the bed of Miocene gravel) half a mile to the north of the Keogh ranch buildings.

It is unnecessary here to enter into a detailed description of *Trapa* (?) *microphylla*, although the value of the knowledge gained from the discovery will be better appreciated by a brief mention of the chief features of the history of the plant elicited since the time of its first discovery.

The species had a geographical range extending through the western interior of North America from Alaska to the northern states of the United States. It also had a long geological record, for its remains occur in several freshwater formations which range in age from late Cretaceous to early (Palaeocene) Tertiary.

The first report of the species, based on only a few detached aerial leaflets, was published in 1861, but it was not until 1876 that the plant, because it most nearly, yet vaguely, resembled the genus *Trapa*¹¹ amongst modern types, received the name *Trapa* (?) *microphylla*. This, although

believed to be incorrect, it has retained to the present time. Since 1876, innumerable examples have been collected from several regions, but in all instances prior to 1936, no characters of the plant other than the customary foliage were discovered.

It had long been hoped that the discovery of specimens exhibiting new characters, especially the fruit attached to the foliage, would ultimately be made, and so lead to the recognition of the true botanical status of the plant. Already it had been presumed that it was an aquatic type, and that the part hitherto found probably represented floating foliage¹², which was in the form of a rosette.

During the years 1936 and 1937 the writer discovered the above-mentioned specimens, which, although exhibiting hitherto unknown characters, including attached fruits, failed to reveal the true affinity of the plant¹³. Apparently there is no known family, either fossil or modern, to which it can definitely be linked, and accordingly it must still remain what has been called a "botanical outcast". It was discovered, however, that during life the plant produced more than one fruit, exact number unknown, the form and size of which, as well as the mode of attachment, was thus established; that it possessed submerged leaves, which in form and size were entirely different from the foliage hitherto known, thus

(11) Water-chestnut, now indigenous to Europe and Asia.

(12) Berry, E. W. — A Preliminary Contribution to the Floras of the Whiteland and Ravenscrag Formations. Mem. 182. Geol. Sur. Can., 1935, pp. 61-64.

(13) Brown, R. W. and Houldsworth, E. — The Fruit of *Trapa* (?) *microphylla*. Lesqueretux. Jour. Wash. Acad. Sci., Vol. 29, No. 1, pp. 30-39.

Photo 17. *Trochodendroides cuneata* (Newberry) Berry. These leaves show three of the numerous variations of form peculiar to this species (one-fourth natural size).

Photos by W. Shevchenko.

Photo 18. *Paranymphea crassifolia* (Newberry) Berry. A species of "water-lily". Leaves of this species are numerous in the bed which yielded *Trapa* (?) *microphylla* (Photo 23) (nearly one-third natural size).



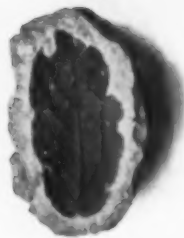


Photo 19. *Rhamnus* sp. Belongs to the buckthorn family (nearly one-third natural size).

Photos by W. Shevchenko



Photo 20. *Pterospermites* sp. It is doubtful if this genus is represented amongst modern flora (nearly one-third natural size).

Geological Section in Big Muddy Valley

Era	Period	Epoch	Formation
Cenozoic	Quaternary	Recent	Alluvium in Valley Bottoms
		Pleistocene	Glacial Drift
	Erosional Unconformity		
	Tertiary	Pliocene	(Absent)
		Miocene	Wood Mountain Quartzite gravel bed at Keogh's Ranch
		Oligocene	(Absent)
		Eocene	(Absent)
		Erosional Unconformity	
		Palaeocene	Upper Ravenscrag Buff Facies
			Grey Facies
Mesozoic	Upper Cretaceous		Lower Ravenscrag (?)
			Erosional Unconformity
			Whitemud

Based on the Table of Formations in "Geology of Southern Saskatchewan", Mem. 176, Geol. Sur. Can., 1935.

The Eocene and Oligocene are included in the Table to emphasize that they are absent in the Big Muddy Valley, but they really should be included in the erosional unconformity above the Palaeocene.

proving that the plant was aquatic in habit; and that it was anchored to the bed of the water by a stalk. The discovery of the attached fruits also decided the identity of certain isolated fruits which previously

had been reported from rocks of several regions, and which had been referred erroneously to various entirely different kinds of plants.

Although all that was anticipated from



Photo 21. *Fraxinus leii* Berry. A species of ash (nearly one-third natural size)

Photos by W. Shevchenek



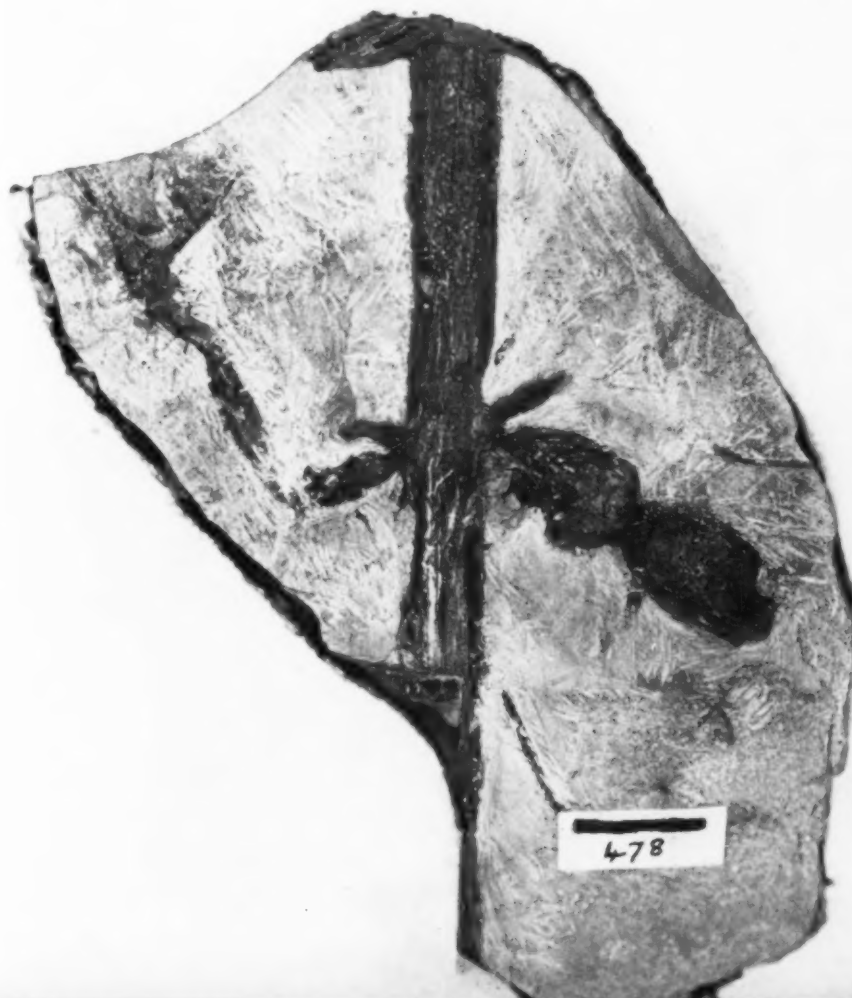
Photo 22. *Viburnum antiquum* (Newberry) Hollick. Belongs to the honeysuckle family (slightly more than one-quarter natural size).

the discovery of these specimens was not realized, it is satisfactory to note that additional knowledge regarding the species was first obtained from rocks in the Big Muddy Valley. This fact, in a measure, supports the contention that the region deserves intensive palaeontological exploration in the future.

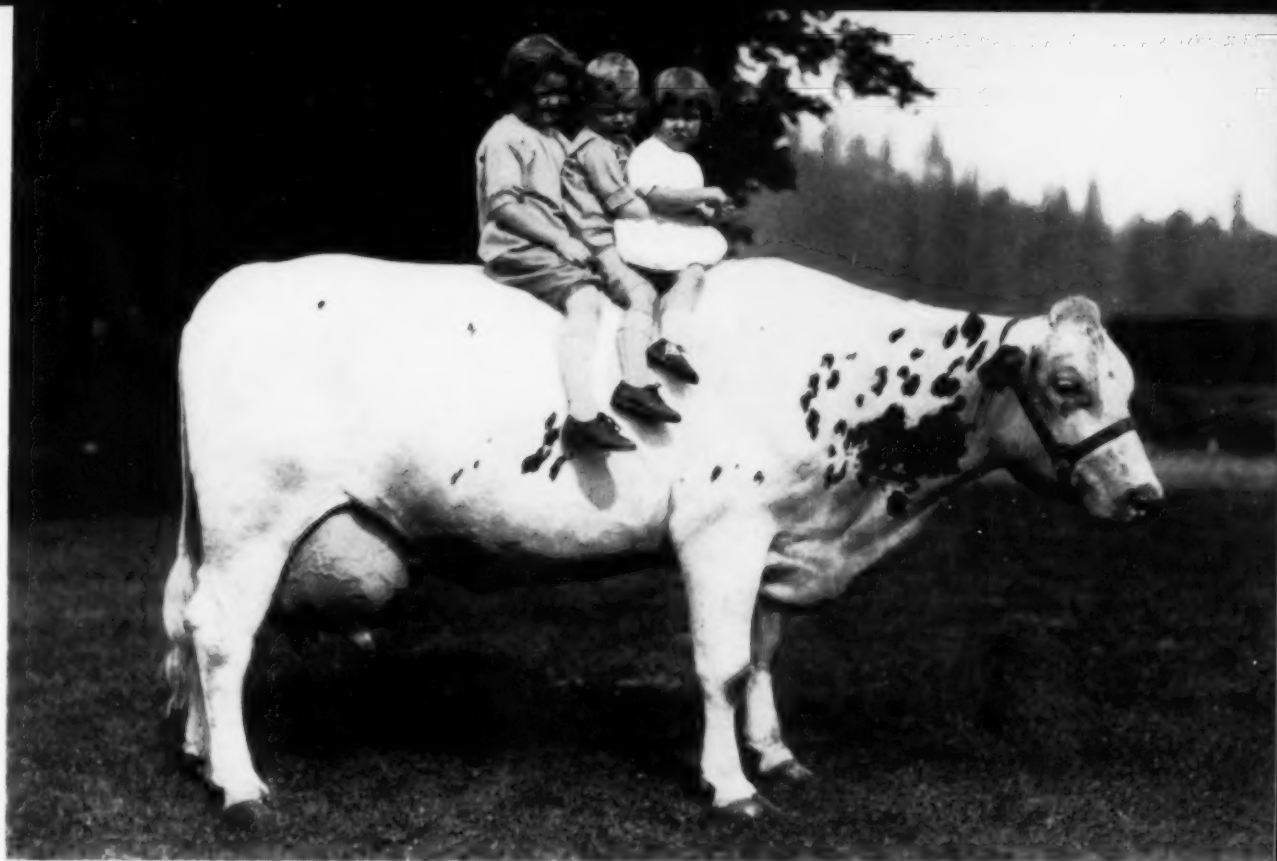
In concluding this description of the Big Muddy Valley, the hope is expressed that what has been written, together with the accompanying illustrations, will serve in some measure to arouse curiosity at least regarding a worthy but sadly neglected section of southern Saskatchewan.

Photo 10. *Equisetum haydeni* Lesquereux. A species of horsetail or scouring-rush. Fragment of the rootstock, with "tubers" attached (natural size)

Photo by the late
J. R. C. Honeyman







The cow — the foster mother of the human race

CHEESE AS A WAR-TIME NECESSITY

by RALPH PURSER

CCHEESE, a concentrated dairy product rich in elements vital to human growth and well-being, has taken on added importance under war-time conditions. All food and no waste, a source of high quality protein suited to growth and repair of body tissue, of calcium and phosphorus for strong bones and sound teeth, of fat for heat and energy, and of vitamin A so necessary as a protection against disease, it constitutes an ideal foodstuff for shipment and storage.

The Old Country would like to have lots of it. In cities and towns where the usual course of life is disrupted, cheese readily fits into the picture. Its concentrated form and the ease with which it may be kept or transported makes it a valuable food for a people living as the Old Country people have to live to-day; it does not even have to be cooked. As these lines are being written, the general rationing in effect in the United Kingdom

limits the amount of cheese available to the ordinary individual to one ounce per head per week, or just about two good bites. That, they think, is not enough.

In recognition, however, of its adaptability to the needs of agricultural workers and to miners, a special ration is allowed to these workers of eight ounces per head per week in lieu of certain other foodstuffs. "Cheese is the most suitable food for taking underground," states the general secretary of the South Wales Miners' Federation, "because of the dust that is flying about, butter, meat and other soft foods are not so suitable, even if they were available in sufficient quantity."

The British market favours a firm bodied cheese with a smooth meaty texture and full flavour. Canadian cheese is generally held for some months before being offered to the retail trade, and so keeping quality is very important. British importers do not desire a quick maturing type

Top left:—Dairy farm at Pownall, Prince Edward Island

Bottom left:—Good dairy country in eastern Quebec — shade, water and grass

from Canada. On the other hand, neither is a stiff, overly hard cheese wanted. A cheese with smooth waxy texture and firm body, that can be carried in ordinary storage for several months before being offered to the retail trade, is what is wanted.

Britain has called for 112,000,000 pounds of Cheddar cheese from Canada for 1941. This means that at least 152,000,000 pounds of cheese should be produced this year to meet this export demand and to provide for the domestic needs as well. The country is doing what it can, but cheese men are wondering if this production will be achieved.

It will not be easy. There are economic considerations bound up in the undertaking. There is the matter of dairy management in the face of feed prices and of labour shortages due to the war situation. There is the tendency to divert milk to condenseries and an expanding use of milk for other purposes on account of the expansion of war-time industry. There is the physical difficulty of endeavouring to increase milk production to offset these tendencies and to meet the increased cheese requirements, either by increasing the average per cow or the total number of cows, or both. Dairy officials estimate that 600,000,000 pounds more of milk are

required in 1941 for all purposes or roughly the product of last year's cow population plus that of 135,000 additional cows. The order of the Dairy Products Board requiring all Cheddar cheese manufactured in Ontario and Quebec on and after May 26, 1941, to be exported to the British Ministry of Food was a further step toward meeting this requirement.

Canadians themselves are not particularly heavy cheese eaters. Under normal conditions they ship about two-thirds of what they produce out of the country. Each Canadian under peace-time conditions eats less than four pounds of cheese per year, a figure which is lower than that of Australia, New Zealand, United States, and many European countries. The latest available peace-time figure for Great Britain is more than twice as great as for Canada, while the figure for Switzerland is more than four times as much as that of Canada. When cheese, butter and whole milk are combined, however, Canadian consumption of these dairy products together is amongst the highest in the world. Furthermore, the comparatively large consumption of meat and eggs in Canada may also account to a certain extent for the low consumption of cheese.

Cheese to-day is produced the world over: sometimes under conditions that still retain much of the primitive about them, in caves, in farmhouses, but mainly in factories, small and large even to those that are the last word in scientific precision and efficiency. It is represented by many types from the solid, mellow and agreeable Cheddar to the semi-soft, malodorous Limburger, and includes numerous forms that are a special delight to the epicure whose taste can detect every subtle gradation in flavour and aroma.

In general, cheese may be classified into those made with rennet and those made without. Of those made with rennet some are what is called hard, some soft. Of those made without, the common Cottage cheese is best known, wherein skim milk is allowed to curdle by natural or induced acidity and the curds separated from the whey as the basis of the final product. When made with rennet, this cheese becomes practically the same as Neufchatel cheese, a French product. Even to-day, many a Canadian housewife produces Cottage cheese as a matter of course as a simple, easy and effective way of using up small quantities of excess milk that has started to turn sour. It is very



Left:—Breakfast time in the stable

probable that this type of cheese was the first known to man, due to the ease with which it may be made.

The English, American, and Canadian Cheddar — the latter the common unprocessed "Canadian" cheese — the Swiss Gruyère, with its characteristic holes, the Italian hard and dry Parmesan and the Dutch ball-shaped, red Edam cheese are all examples of hard cheese made with rennet. Examples of soft varieties are the Neufchâtel cheese mentioned above and the French Camembert and Brie. In a class by themselves are the English Stilton, the Italian Gorgonzola and the French Roquefort, with their peculiar and distinctive flavours derived from moulds implanted in the curd.

By far the greatest proportion of unprocessed cheese manufactured in Canada for sale and export is the Canadian Cheddar. With this type of cheese, whether mild or strong, coloured or uncoloured, Canadians are familiar. A very limited amount of processed cheese is also being exported at the present time.

Before the cheese factory appeared upon the Canadian agricultural scene, many farms produced their own cheese mostly for family use. A few farmers in Ontario and Quebec with large herds took it up as a marketing proposition and put out a product well worthy of their efforts, the maker's name often being preserved on the product as a mark of distinction. According to the 1861 census, Ontario produced 2,687,172 pounds of cheese, Oxford county heading the list with 457,348 pounds, more than double that produced in York, the next on the list, followed in turn by Glengarry, Ontario and Northumberland, which produced a little over 100,000 pounds each.

A century-old treatise on Canadian agriculture, in a chapter on cheese-production, lists the following circumstances as injurious to the quality of cheese: allowing the cows to get rank or ill-flavoured grass or hay, these conveying a bad flavour to the milk and cheese; allowing the cows to run and heat themselves; driving them far to be milked, which makes the milk froth much in milking; and carrying the milk from the place of milking to the dairy and allowing it to remain long after it is milked before it is set with the rennet. These statements are just as true to-day as they were then.

"The greatest dependence is upon the

- (1)—A modern cheese factory
- (2)—Weighing in the milk which is run direct into the cheese vats.
- (3)—Cheese curd in the vat before milling
- (4)—Milled curd ready for the press





dairy maid," this interesting treatise records further, "and the chief art of making cheese of the finest quality lies in her management. A dairy maid is selected for skill, cleanliness, and strict attention to business. Her work commences at four o'clock in the morning and continues without intermission till bed-time."

In many cases, undoubtedly, when there was no dairy maid, the duties of cheese-making in the early days devolved upon the good housewife. When quantities handled were not too large, a wash boiler on the kitchen stove or before the open fireplace was used when it was necessary to heat the milk. Curds were often drained by use of a specially-constructed basket and placed in a wooden mould or cheese-hoop, fitted with a home-made lever arrangement for pressing.

Cheese factories and modern equipment have taken the work of commercial cheese making out of the hands of the housewife and the dairy maid. To-day less than one per cent is made on the farm. Dairy schools now initiate budding cheese makers in the art and science of cheese making. A Dairy Industry Act provides for the official grading of all cheese sold for export, and under this Act a large percentage sold on the domestic market is graded as well. A Dairy Products Division of the Marketing Service of the Dominion Department of Agriculture arranges and supervises car service for cheese (as well as other dairy products), and supervises loading and stowage of perishable produce exported from Canada by ocean transport and the discharge at principal ports in the United Kingdom. It administers the Cold Storage Act, under authority of which the construction of cold storage warehouses in Canada may be subsidized under certain conditions. In short, the industry has changed from an individual type of farm enterprise to a national industry of magnitude.

Oxford county in Ontario is still an important cheese-making county, as are also several of the neighbouring counties, but a greater concentration of factories now exists in the counties of south-eastern Ontario, in some of the eastern townships of Quebec, and in other parts of these two cheese-making provinces, which contain practically ninety-five per cent of the factories of Canada.

(1)—Cheese in the curing room

(2)—Ripening room showing temperature control

(3)—Government inspectors stamping cheese

(4)—Receiving cheese at warehouse in Montreal

CHEESE AS A WAR-TIME NECESSITY

The first cheese factory in Canada — as distinct from the individual farmer's cheese-making premises which was sometimes called a "factory" when housed in a separate building — was established in Oxford county in 1864. They increased rapidly in number and soon spread to other parts of the province and to Quebec. Ingersoll, and later Belleville and Brockville became noted as important centres for the industry to such an extent that they gave their names to the product as made in their respective localities. Exporters or their representatives located at these centres began dealing in "Ingersolls", "Bellevilles" and "Brockvilles", designations that eventually came to represent quality and character of cheese rather than definite places of origin. Under the factory system methods of production improved steadily, though hardly with the same celerity as did butter making when butter factories were later on established. The latter when they were introduced, to some extent weakened the position of the cheese industry.

Factories have been of practically every type of organization from the proprietary to the co-operative. As a rule, even from the first, they were spacious enough and, in general, well suited for their purpose. Separate rooms and sometimes even separate buildings — connected by a runway or wooden track — were used for the manufacturing process itself and for the curing of the cheese. Often the entire summer's make was held in these curing rooms and disposed of all at once in the fall. Without temperature control this cheese, due to the hot weather, often presented cracked surfaces that provided fertile habitation for the larvae of the cheese fly, the well-known "skipper" of the early days. With the organization of export trade and the constant movement off the shelves to supply it, the practice became unnecessary, but the injurious effects of high temperature turned the thoughts of the cheese maker to temperature control. Cost, of course, was a consideration, but many factories provided for it more or less completely.

The Dominion itself took a hand, and the Cheese and Cheese Factory Improvement Act of 1939 provided, among other features, for assistance to be granted to factories which wished to improve their cheese maturing facilities through insulation and refrigeration. Other provisions of

the Act provided for the granting of a premium on cheese of highest quality. Beginning June 1, 1939, this premium was one cent per pound on all Cheddar cheese scoring from ninety-three to ninety-four points and two cents on all that scoring ninety-four or more. Payments made on this account to March 31, 1941 totalled \$1,652,408.51.

Additional Dominion payments recently instituted on cheese exported to the British Ministry of Food now amount to one and six-tenths cents per pound. The provinces of Ontario and Quebec have also subsidized cheese production. In Ontario this subsidy is two cents per pound on all Cheddar cheese produced on and after February 1, 1941, and the Quebec rate is two cents per pound on all first grade Cheddar cheese produced on and after May 1, 1941. These premiums and subsidies bring the price at Montreal of high grade export cheese to the Ontario and Quebec producer up to twenty cents per pound.

Though the early factories may have been well enough built to start with, the quarters themselves were often most unattractive. Nowadays, however, stringent sanitary regulations, public aversion to unsightly construction and to evil smells, and the use of concrete floors have worked wonderful changes. Improvement has even gone further and has extended to the surroundings and adjacent grounds. Cheese factory improvement competitions have been held from time to time wherein prizes were offered to factories showing the most improvement in beautifying the surroundings and the general appearance of the premises. One such type of "beauty contest", for instance, is being held during the 1941 season in the county of Carleton in Ontario.

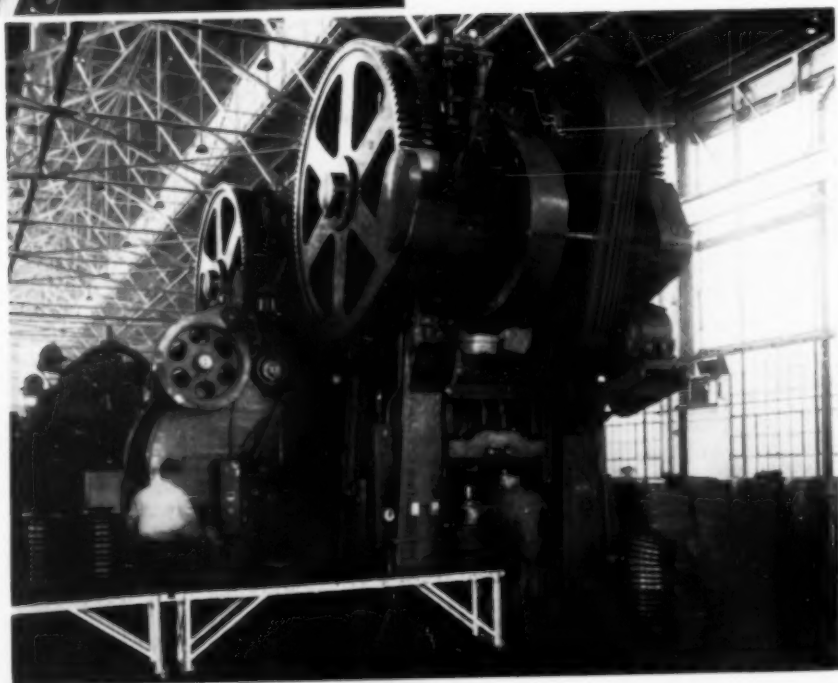
British Empire Dairy Show at Belleville, Ontario





Row after row of completed pre-tested truck engines ready for shipment to the truck assembly plant

Giant presses for stamping one-quarter-inch steel wheels for army trucks



Looking down the full assembly line where military vehicles are finished, ready to drive, at the rate of one every two or three minutes.

WAR AND MOBILITY

by D. J. Richards

The Canadian makers of automobiles had a new task to perform. They approached it from a fresh viewpoint. They cut sharply the normal time required — did it by co-operation.

THE essence of war is mobility. It always has been. So far as the finite mind of man can see, it always will be. Genghis Khan, the thirteenth century conqueror of Asia and parts of Europe, owed his victories as much to the speed of his horses as to the power of his arms. Napoleon defined it as the ability to mass superior forces at the point of impact. The great writers on military tactics from Baron Carl Von Clausewitz to Liddell Hart, have discussed it. The blitzkrieg was not a new conception — it was known to would-be conquerors of the past — the German language gave it a new name.

In course of time, there came a great change. The internal combustion engine was developed. It exerted a tremendous influence on the world — especially on war. The horse left the battlefield — outmoded. The whole field of war broadened, enlarged, expanded. War became totalitarian, three-dimensional. It took to the air. It went under the sea — even under the earth. The horse had a limited range — it was slow — its food consuming capacity, in relation to speed and carrying power, was great. It had too much weight for its strength. The horse grows tired, but the horsepower of the plane never wearies. The internal combustion engine made possible the mobility of manpower and of striking power. New conditions arose. The three-mile distance from shore measured the limitation of territorial sovereignty in the old days. It represented the range of artillery at the time the rule was established. The sovereignty of the modern nation tends now to be limited only by the distance which planes can reach and return with safety to their base. It was inevitable in the nature of things that those seeking power should consider the new forces of action. Would-be conquerors decided to test their theories on new fields of conflict.

Then followed "total war". Manpower no longer determined the course of victory — it was man plus machines. The greater the volume of equipment, the greater the capacity for speed, the stronger was the striking force. It was the age in which the industrial nation made its bid for world domination. Numerically, the army was

on the home front. The nation with the factories which could produce the most effective weapons or the one which, from the rightness of its cause, could draw others to it, was the potential victor.

Power rested, not in the army, but in the factory. The factory was the source of victory but it needed the tools to produce. Production in industry was no longer a matter of men but a question of machines. Men were needed to produce the tools, to make the machines with which to do the work. Between 1914 and 1940, the index of labour productivity rose from 100 to 245. Between 1914 and 1919, the index rose only seven per cent. Between 1919 and 1939 it rose from 72 to 164. The worker in 1940 could produce almost as much as two and a half workers in 1914. In the "blitz" type war, volume was essential — so was speed. New conditions, while in some ways increasing the capacity for defence, had increased the ability to pursue. The opportunity for the destruction of a defeated army was greater than ever before. In the olden days, a defeated army might retire within the walls of a city and withstand, for months, the assault of the opposing forces, but in the new type of war, the city itself would be ground to ashes. It was not only necessary to arm — it was essential to arm at once. The nation with the initial advantages held trump cards. Under existing conditions, it might be assumed that wars would not last long. It was a type of war in which speed was the essence of success — victory hung upon the minute hand.

But here again another factor intervened. The United Kingdom was an island. No matter how strong on land the opposing force — its control stopped with the shore. It made for freedom a breathing space. In the conflict between sea forces and air forces, the battle is not yet decided. We know it is not one-sided. Sea power, by the exercise of the blockade, has imposed stern conditions on the axis powers. Their losses of shipping and their inability to import impose heavy tasks upon their people. The island fortress stands. The forces of democracy rally around it. The battle of the factories



CANADIAN CARRIERS





UNDERGOING FIELD TESTS





Many ingenious tests are devised for the powerful four-wheel drive eight hundredweight units for the armed forces; up and over steep grades (above); splashing through streams (right page).

goes on with ever increasing violence.

Democracies are slow to start in war. They were trained to conceptions of peace. They realized that progress, as they had recognized progress, could only be extended by the abolition of useless conflict. They sought the happiness of the people — the raising of the standards of living. They recognized that the fruits of the earth belonged to the people of the earth, and that permanent peace could never be brought about or built on the theory of a world part free but mostly slave, while those who thought themselves free were held tight in the bondage of their own convictions, the determination to make others their servants and their slaves. Free men can never be a party to the enslavement of others.

It takes a moment or two to recover from the impact of a blinding flash. For the democracies, the war really began with Dunkerque, little more than a year ago. They realized then the strength of the new force which had broken loose. It became, at

once, a question of the power of freedom to move men into action to out-match and to out-last the forces of despotism.

No matter how strong the urge, time was required. Factory buildings do not burst spontaneously from the ground like crocuses pushing upward through the snow. Speed can be increased if manpower is available — three shifts can work in twenty-four hours. Still, there are human limitations. If there are difficulties in the erection of buildings, there are still greater difficulties in providing machine tools — powerful machines which fashion metal to form. Jigs, specially built to fit the particular task, must be obtained. They are built to order. Add now gauges and dies — these must be accurate. "Tooling up" means equipping a plant for production, and much of the equipment consists of intricate precision tools which must be made with definite margins of tolerance. The United States is the main source of supply for machine tools. Normal production of industry for domestic and export trade has been approximately \$160,000,000 a year. In 1941, it is expected to produce machine tools valued at over \$700,000,000 — some anticipate \$800,000,000. In an industry so crowded with business, it is quite impossible to order to-day and get delivery to-morrow. The business has a seller's market — the buyer does the waiting. The whole conception of the machine tool industry lies in a series of tools under which the product passes down the line, changing form and shape, moving steadily onward to its ultimate destination — a finished product, forming a part of another product — moving now from the production line into the assembly line.

There arises, naturally, the question of how to make the best possible use of the machines already available. Here the splendid co-operation of one industry indicates the possibilities of sane co-operative action. The Department of Munitions and Supply wanted army motive equipment. The range of requirement was large—time was short. It involved trucks, Bren gun or Universal carriers, heavy duty artillery tractors, vehicles on wheels and with tractor treads, with two-wheel and four-wheel drive, radio cars, cars with repair equipment — a workshop on wheels — a wide range for many purposes. They were needed, not only in Canada for training purposes, but for the export market. They have gone out to the United Kingdom,

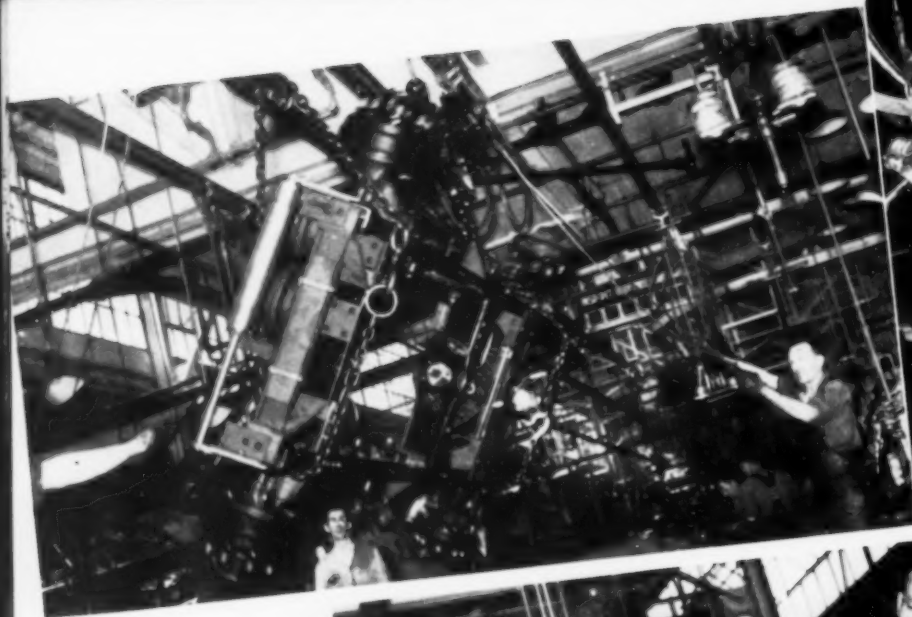
Australia, New Zealand, India and South Africa. They have faced the sands of Egypt. They have been in Greece with the Australians — in Ethiopia with the South Africans. In the battle for freedom they have played a great, a tremendous part.

There are two large automobile plants in Canada capable of doing this work — Ford and General Motors. They have tremendous productive capacity, but to throw this extra load on top of existing volume seemed impossible, at least theoretically so. These firms are competitive. The work would naturally be divided between them. The impossible provides an obstacle to overcome at the call of necessity. Both firms proceeded to tool their own plants for further production, in order to bring them to full capacity. At the same time, they decided to use the full equipment of both to fill immediate demands. A survey was made of each plant. The surplus capacity in both was put to work. The engineers of both co-operated in the task. Stampings and sheet metal parts came from one company, running gears and other parts from the other. It was a united operation of two staffs in a determined effort to do an effective piece of work in the shortest possible time.

The co-operation resulted in the full use of existing equipment. This could not have been accomplished with the plants functioning separately. The convoy moves at the pace of the slowest ship. Factory speed is slowed down by any bottleneck which restricts the flow. By working together, they obtained an increase in the effective capacity of both. When more men are at work there are additional man-hours of production. In modern industry, men work on machines. When men go to work on machines, there is an even greater increase — it becomes additional machine-man-hours of production rather than man-hours — a very different thing so far as volume of production is concerned.

In another field of war effort, the entire technical resources of the Chrysler Corporation in engineering, production and management have been placed at the disposal of the Canadian Government (without financial reward or interest of any sort) to assist in the production of 25-pounder field guns and medium calibre naval equipment in a Canadian plant. This plant is now in actual mass production of these highly efficient artillery weapons. It is the only plant in America which goes through the entire manufacturing process from raw material to finished gun and

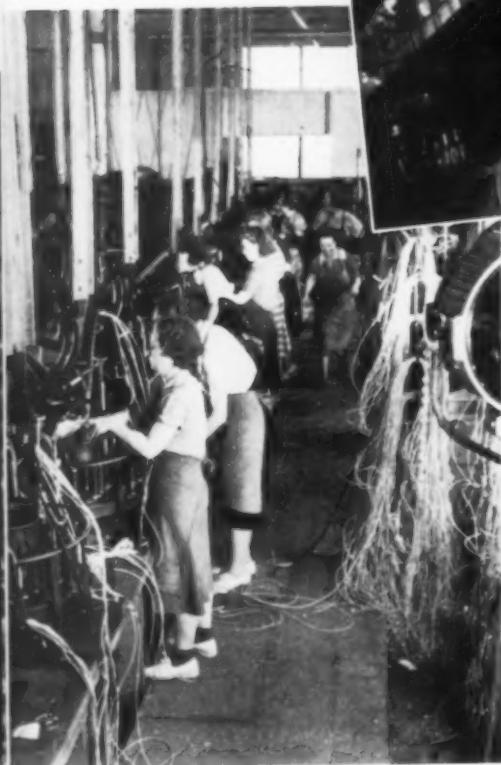




Above: — Army truck frame reversed to its final position on assembly line.

Top centre: — Riveting frame with pneumatic riveters.

Right: — Installing radiator.



Above: — Girls braiding wire harness assembly for electrical system.

ROLLING ON TO

Power wrenches tighten up the under carriage.





Above: — Assembly line just before cowl installation



Left: — Blackout head-lamps can be seen on army truck body being installed.

ON TO VICTORY

Long rows of army trucks ready for body installation



Above:—Gun tractors like this haul the field guns at blitz speed, also carry five members of gun crew.



Further tests for army trucks: through deep mud, steep hills and dense brush (above), over a clearance ramp (below).



carriage — from scrap metal to chrome-nickel steel — from steel to ingot — from ingot to rough forging — from forging through the long process of machinery boring and rifling to the finished gun and carriage with its many intricate parts, all manufactured to the finest limits of accuracy.

At the same time Chrysler Corporation of Canada, Limited, was giving further proof of the quick adaptability of the automotive industry to war needs, in the production of motors, specialized war vehicles and standard chassis with special bodies and equipment.

Thousands of motors were produced and shipped to Britain or retained in Canada for use by the Canadian Army and Air Force. To-day these motors are proving the flexibility of the automotive power plant by furnishing power for barrage balloon hoisting over England, for searchlights, for training tanks and for many other war uses. The Chrysler Corporation has also built thousands of standard vehicles with special equipment for use by the Army and Air Force and for hauling goods over the Burma Road to China.

A fast four-wheel drive light combat unit with phenomenal performance has also been coming off the assembly lines at Chrysler plants in Windsor. Thousands of these vehicles are now in actual use in combat zones, and in transit.

Expansion of industry in all these war industries needs men — men trained to run the machines. Many of those now entering the factories are country lads familiar with machines. Keeping a binder, a tractor or a combine in shape involves practice in the

use of tools, though quite different in form from the machine tools of modern industry. Some of these lads have had training in technical schools. It helps. They make more rapid progress when they enter the training school of the plant in which they expect to work. Canadian youth is adaptable — it is inquisitive — it wants to see how things are done. It is acquisitive — it wants to acquire the capacity to do things. The men who train these lads are veterans of the art. They are proud of the boys they train and of the progress they make. In a short time they are able to work alone, with advice available when needed. They enter the army of industry. The mass production factory, the assembly line, the production line, is not a place of rush — it is a place of efficiency. The engineer, the tool maker, plan to conserve energy — not to waste it. The object is to accomplish the maximum result with the minimum of effort. The boys who train in the factories of Canada will learn much worth knowing in the field of Canadian industry.

How much time was saved by this co-operative effort of these plants? It is, of course, difficult to measure it accurately, but it is a fair guess that delivery date was advanced somewhere between four and six months — tremendous saving of time in an emergency. Competitive? Certainly. These corporations are keenly competitive in their own work; but the strength gained in competition in the open field in time of peace was combined and thrown into the effort to help supply, in shorter time, the equipment essential for the far sharper conflict of war. Did not the Duke of Wellington say that Waterloo was won on the playing fields of Eton?

Products of the Canadian Automotive Industry for Overseas

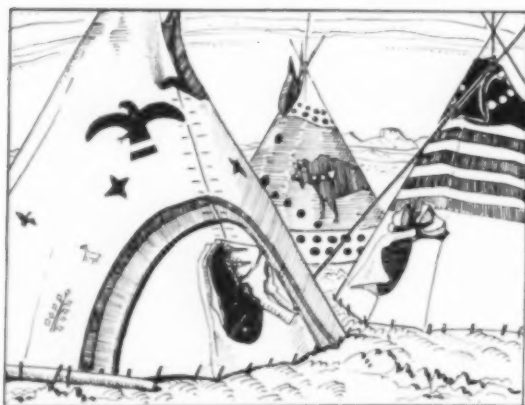


PRAIRIE TOTEMS

by ANNORA BROWN

"MY father was quite a hero in his day," Eddie Merry Horse told us with mingled modesty and pride. We were making drawings of teepees at an "Old Timers'" celebration in southern Alberta.

Eddie's father had been granted the privilege of using an animal, (in his case the beaver) for his "medicine", in recognition of the most admired of all qualities, courage. Had he been a West Coast Indian, he would have erected a totem pole outside his cabin, from which all the world might read of his noble ancestry and great deeds. But where could a prairie Indian find the great poles for a totem, and of what use would it be in his roving life? Instead of erecting a totem pole which he would have to leave near some permanent dwelling, he painted a teepee that could be carried about with him, as he and his family moved over the prairie after the constantly moving buffalo herds. This had the advantage of being always at hand to impress chance visitors from friendly tribes.



The Thunder Bird is as much to be feared and besought for protection on the prairies as elsewhere. On a teepee it invokes protection for the family, while on weapons it inspires courage. The rainbow over the doorway also symbolizes the Thunder Bird with its many coloured feathers. The morning star brings dreams. Over the doorway to the right is a medicine bundle, placed there for protection and safe keeping. In the background is the mountain peak which is the home of the Thunder Bird in southern Alberta. It stands up, blue and imposing, on the boundary between Canada and the United States.



A typical modern group with teepee poles

Before contact with the whites made canvas available, the teepees were made of buffalo hides carefully scraped and tanned by the squaws. No matter how wealthy an Indian might be, his squaw did her own scraping and tanning, or her laziness became a subject for the teasing and jeers of the other squaws. When the hides were tanned and softened, they were sewn together in semi-circular form to be mounted on poles tied together at the top and spread into a circle at the bottom. The front of the teepee was held together with wooden pegs. A slit was left for the entrance and a piece of canvas or hide draped in front. At the top, above the entrance, were two ears or smoke flaps, used to regulate the draft and direct the course of the smoke from the open fire inside, through the top of the teepee.

When the Indians decided to move their camp, the teepees were taken down and folded into a compact roll. Two poles were tied together at the slender end and placed across the neck of a horse, the heavier ends trailing on the ground. Across these was stretched a willow frame, which was loaded with canvas, household effects, and sometimes children or the old and sick, thus forming the typical prairie conveyance known as the "travois". This was a most compact and suitable arrangement, which provided for home, totem pole and moving van in one.



The Black Buffalo teepee as erected by the North Peigans at the Lethbridge Stampede. This teepee was recently bought by the North Peigans from the South Blackfeet at Browning, Montana. When an Indian buys a teepee, he buys not only a piece of decorated canvas, but all the ceremonials, medicine bundle and protective power that belongs to the teepee.

When a man had attained a reputation for bravery in the eyes of his fellowmen, he decorated his teepee with a story in pictures of his many adventures and victories. (An Indian never records a defeat). These are known as war teepees. But when the inhabitants of the spirit world approved of his brave deeds and righteous character, they revealed to him, in a dream, the design for a "medicine" or sacred teepee, and he was doubly blessed. It is these sacred teepees that are truly inspired in design and symbolism.

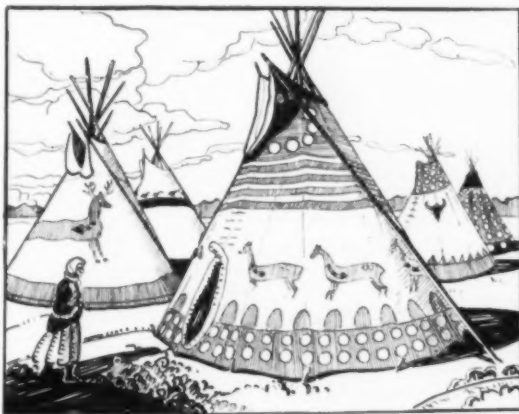
Animals, as the highest form of creation, were held in reverence as the equals and, oftentimes, the superiors of men. An animal usually formed the main motif of the design and was the "medicine" or good-luck animal of the teepee owner. The animal might be deer, elk, antelope, otter, beaver, weasel, or any of the prairie animals. The bear, because of his strength, and the buffalo, because of his usefulness, were especially sacred.

A people living for generations on the prairie, with the great expanse of sky overhead, the brown rolling hills and limitless distance to eastward, and the blue mountain peaks fringing the western horizon, were certain to have used sky, prairie and mountain peaks as the very essence upon which to build their mythology and designs. Sleeping under an arch of sky uninterrupted by trees or

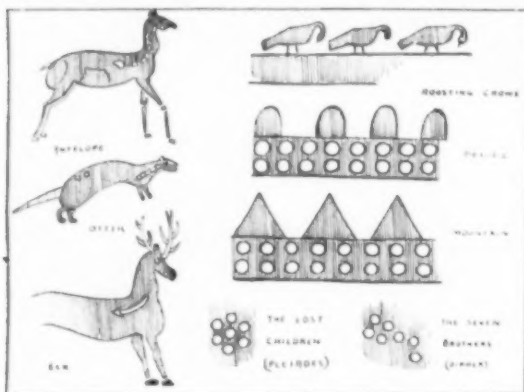
mountains the prairie Indian originated far more stories of the stars than the mountain or forest dwellers.

Most of the teepees are black at the top, with white or pale green discs, representing stars against the night sky. A black top and seven "stars" represent the constellation we know as the Dipper or Great Bear, but which is, to them, the Seven Brothers, who, after fleeing from danger on earth, at last found refuge in the sky. The Seven Brothers, revolving around the Star That Never Moves (the North Star), is the Indians' night clock and was accurate enough in the days when there were no trains to catch. Another constellation often represented is the Pleiades group, known to them as a group of small children lost on the prairie during the summer but returning with the cold weather. The decoration of one teepee consists almost entirely of stars on a dark background.

Around the bottom of the teepee are rows of white or light coloured discs exactly like the stars above except that they are placed on a red background instead of a black one. In the days before the white people tore up the prairie and laid it out in square fields and weed-filled roadways, a nightly crop of mushrooms and puff-balls dotted the prairie. "Old Timers" tell stories of gathering mushrooms in wash-tubs from the rich prairie soil, the interest of the pioneers being purely practical. The Indians have the poetic suggestion that they are stars or meteorites fallen from the sky at night.



A group of Indian teepees — elk, crow, antelope, buffalo head, and star



And so, instead of painting daisies around the lower part of their teepees, to symbolize the earth, as Europeans would have done, these prairie dwellers paint a band of earth stars—light discs on a red background. These they call the "dusty stars" (McClintock—*The Old North Trail*) because of the brown powder which flies from the puff-ball when it is broken.

Around the edge of the prairie are rolling hills and sharp pointed mountains which, on the teepees, are represented above the band of earth stars, by sharp pointed triangles for mountains and rounded mounds for hills.

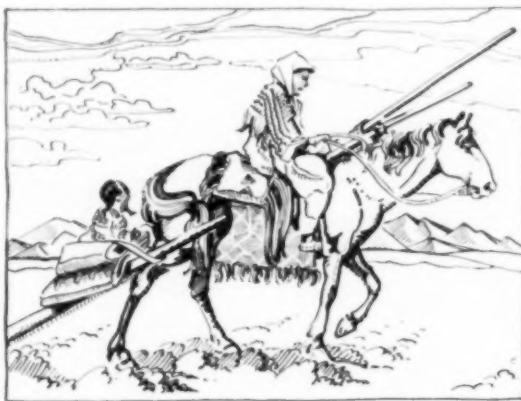
Very often bands of red are placed around the teepee. These bands, according to McClintock, are bands of lightning, the trail of the Thunder Bird, but according to our informant, they represent water. He pointed out one teepee with seven stripes, which indicated that seven of the family had been drowned. The significance probably varies according to the plan of the designer.

Between the stars above and the earth below would be placed the particular animal whose magic power protects the owner of the teepee. One or two large animals or a row of smaller ones would be used, depending on the size of the animal in nature. A buffalo or elk would cover practically the entire space, while a row of several antelopes or otters could be placed around the teepee. With the innate sense of design of primitive people, the animal was represented in a decorative manner and colouring, with sensitive drawing worthy of a great master. An arrow in green and white always points to the

heart of the animal, while two small round spots, usually in red, mark the end of the backbone.

No two teepees are exactly alike and almost every phase of nature or unusual occurrence has been the inspiration for a design. Sleeping one night on the prairie, near the mountains, west of the Peigan Reserve, our attention was attracted by the sight of hundreds of crows flying overhead, straight into the setting sun. Early next morning we were awakened by the sound of flock after flock flying in the opposite direction, from the west toward the prairie and the rising sun. It was interesting to learn later, that these crows were flying to roost on Crow's Nest Mountain (known as the Crow's Lodge by the Indians), where they have roosted for years, perhaps centuries, on the trees of the mountainside. These crows, resting on the mountain, were the inspiration for a teepee design. The teepee is surrounded, high up, by a wide band on which rest numerous birds. It is known as the Crow teepee.

The colours, especially on the older teepees, are somewhat limited, which tend to add to the strength and quality of the design. The clear, rich yellow was a mineral dye obtained from native clays. The strong brick red was from the same clay, baked much as we bake our bricks, ground and mixed with oil. Red was the most sacred and powerful colour which the Indians possessed. Black was obtained from mixing charcoal and grease, while the green, which was used in much smaller



When travelling, the teepee poles become the moving van and the conveyance is then known as a travois.

quantities, is a vegetable dye, obtained from a plant much like the licorice. The smoke blackened canvas, shading from nearly white at the bottom to a dark rich grey at the top, makes an ideal background for these colours.

The older teepees were done by, or with the help of, some one versed in art and Indian heraldry, and, like so much of primitive art, are masterpieces of symbolism and design.

It is only under very exceptional circumstances that one of the medicine teepees can be bought by a white person, as it represents not merely a home but a family crest as well. Along with the teepee, the design for which was acquired in a dream, there usually goes a ceremonial dance and a medicine bundle of various sacred skins and feathers which have a part in the ceremonials. An Indian who buys a teepee, binds himself to keep sacred the ceremonies and all the duties connected with the teepee.

Teepees are seen now only on special

occasions like Sun Dances on the Reserves, or at Stampedes where teepees and Indian costumes give a picturesque and "Wild West" atmosphere. The majority of modern Indians live in small log houses during the winter, moving into tents as soon as the weather permits. A circle of poles is, however, a familiar part of a modern group, being used as a means of storing the poles and also as a support for a sunshade in hot weather.

"Glad to have met you folks," Eddie said in parting. "I'll be putting my teepee up if we have a Sun Dance next year and I'll be glad to show it to you. I could have sold it often, but I wouldn't like to part with it."

Along with the teepee, Eddie inherited many horses which are also evidence of his father's bravery. Bravery, teepees, horses and material wealth are a natural grouping. Perhaps that is one reason why teepees are so hard to buy and so are not seen in museums beside the much lauded totem poles of the West Coast.



GEOGRAPHY AT THE UNIVERSITY OF TORONTO

by GRIFFITH TAYLOR*

CANADA is almost the last of the literate countries of the world to establish a Department of Geography at any university. It is therefore rather to be expected that the general level of geographic teaching in the schools is still much below that in other comparable countries, and I shall discuss this point later. Let us first glance at the development of geography elsewhere.

Germany has always been a leader in this subject. As early as 1898 there were 22 universities and colleges (i.e. post High School) teaching geography in Germany. For other countries at this time, C. R. Dryer states that there were in France 16 such institutions, in Russia 11, Austria 10, Italy 7, Britain 6, and the United States only 3. (By 1929 the number in the United States had increased from 3 to 319).

In England the first university lecturer was H. Mackinder at Oxford in 1887, and an independent department of geography started there in 1900. The similar department at Cambridge began a few years later, and to-day has a separate four-storey building, with splendid laboratories and a library devoted to the subject. The Indian and Colonial Services absorb many of the Cambridge graduates in geography.

In the United States the first independent department commenced work in 1903 (under Salisbury and Goode) at the University of Chicago. There are now Professors of Geography at every important university in the States, and indeed both at Chicago and Clark there are four full professors in the subject.

In 1931 the writer moved that a Committee of the British Association (meeting in London) should investigate the status of university geography within the Empire. The report (1933) showed that in South Africa there were independent departments at Pretoria, Johannesburg and Stellenbosch. Starting in 1920 a strong department had been built up at the University of Sydney in Australia. The report concluded "The position in Canada is a remarkable contrast to that in the United States and the Home Country".**

Economic Geography was taught at the University of Toronto in the Department of Economics before 1920. Later, Professor H. Innis gave such courses, and the initiation of the department here owes a great deal to his continued interest. Dr. Cody was very sympathetic to the proposal, and shortly after he became the President of the University, the Chair of Geography was instituted in 1935. It was accepted by the writer, at that time Professor of Geography at the University of Chicago.

There is a rather sharp division drawn at the University of Toronto between Pass and Honour courses. It was decided by the Committee on Geography to commence with Pass courses, so that (as one of the members put it) as many as possible

of the students should be 'sprayed with the new ideas in modern geography'. The first year lectures ("The Ecology of World Resources"), beginning in September 1935, were given with a strong economic slant, so as to be of most use to the large class of Economic students already enrolled. A course on "Geographic Factors in European Civilization" has been given each year to the large class of graduates attending the Ontario College of Education within the University.

In 1936 the laboratory work was commenced. The writer is strongly of the opinion that geography must be founded on some knowledge of geology and physics, and that the use of instruments and the production of numerous maps and diagrams is essential. Essay-writing is a poor substitute for regular laboratory work, though, unfortunately, a few geography departments dispense with the latter. Field-work is a great difficulty in Canada, since the academic year falls in the cold months, and many students are engaged in other work in the long vacation. As far as Pass students are concerned, we have tried to meet this difficulty by basing the laboratory work largely on the local environment. Thus they study the evolution of Toronto, with the assistance of various models made in the Department. The climatic problems are naturally linked with the climate of Toronto and Canada. The lectures are wholly given with lantern slides (often drawn for the lecture), and the study of the topographic cycle is mainly based on local photographs and maps. However, in the new Honour courses, started in September 1940, provision is made for the Honour students to spend a week or so in the field under expert direction.

Second Year Pass lectures deal mainly with Cultural Geography. The writer has long advocated a greater appreciation of this branch of geography, for two main reasons. Firstly the Pass student at any university needs a general appreciation of the problems of human distribution. In our present troubled world, distributions of race and of such cultural factors as *nation*, *religion* and *language* are as important as distributions of crops and minerals. Secondly, a geographical approach to history or ethnology gives us a ready method of understanding the main features of their problems (by means of special maps and diagrams) which has not been much exploited by the historians and anthropologists. Needless to say such ecological problems belong as much to the geographical field as to any other. It is gratifying that most of the Honour students in History attend these lectures in Cultural Geography.

The Second Year laboratories carry on the work of the first year. Such techniques as levelling and plane-tableing are studied in greater detail. Map projection work is continued. The use of accurate instruments, such as planimeters and

*President, Association of America Geographers, Professor of Geography, University of Toronto

**See also the last four pages of my presidential address to the same section (E) at the Cambridge meeting in 1938

GEOGRAPHY AT THE UNIVERSITY OF TORONTO

verniers, etc., is demonstrated. Topographic maps are studied, and block diagrams made therefrom. Each student helps to construct actual models from contours cut in cardboard. Some of the work deals with cultural problems and with agricultural correlations.

In the Third Year laboratory the students learn the fundamentals of map-making. They start with simple apparatus such as sun-dials and astrolabes, which they make themselves. This helps them materially to understand Time and Longitude. Then they pass on to sextants and the co-altmeter. Finally, they are able to work out an *ex-meridian longitude* from the actual observation of the altitude of the sun. The study of correlation co-efficients is taken up, after preliminary work on dot-charts and curve comparisons has been made. A good deal of attention is given to the determination of Koepen's climatic classes for various places.

Through the kindness of our neighbours in the Economics Building we have been able to convert three large basement rooms (once the dining halls of the old McMaster University) into very fair geographical laboratories. Here as many as 100 students at a time can sit at tables large enough for an adequate spread of maps or apparatus. Two other work rooms are set apart for Honour students and for graduate research. We are acquiring a fine collection of United States and Canadian topographic maps, but the Department is still very badly off as regards the numerous books, maps and expensive apparatus which are needed in an up-to-date Department of Geography.

In 1938 a small manual *The Geographic Laboratory* was published to aid Pass students. It was reviewed by Erwin Raisz in the *Canadian Geographical Journal* for February 1941.

Meanwhile the staff was augmented by several Honour graduates. Mr. A. Clark, B.A. (Economics), later obtained his M.A. in this Department, and is now a lecturer in a New Zealand University. Miss Sims, M.A. (History and Geography) was a valued member until her marriage. Miss M. Brookstone, B.A. (Physics and Geography), has recently obtained her M.A. in this Department. Dr. D. F. Putnam, Ph.D. (Agriculture and Botany) is well known for his numerous memoirs on the climate and crops of Canada. In 1939, with the appointment of Dr. (now Professor) G. Tatham (who has had valuable experience in both English and American universities), the staff became large enough to consider the addition of Honour courses. There are also usually four or five part-time demonstrators, who assist in the larger laboratory classes.

From the beginning the attendance has been greatly increased by special classes for teachers. These are given in the evening from 4.30 to 9.30 on one day in the week, and, by August 1940, about 150 teachers had attended at least one year, while about 50 had passed in all three years of Pass Geography. For country teachers three *Summer Schools* have carried out the same programme. This is a very important step forward in the education of the province; for hitherto there were few teachers available to improve the standard of geography as taught in Ontario schools. It will, of course, be some years before arrangements can be made to utilize the services of many of these teachers; but one of the main purposes of our department has been well started, i.e. to provide for better teaching of geography in the schools.

Let us now consider the growth of the young department during the six years of its operation.

GEOGRAPHICAL STUDENTS

Session	Faculty of Arts*			Teachers	Education	Milit. ‡	Grad	Total
	First Year	Second	Third					
1935-36	130			47	350		181	507
1936-37	180	20		47	250			497
1937-38	170	75		125	250			620
1938-39	151	80	50	80	319		2	602
1939-40	119	76	51	55	307		7	617
1940-41	135	47	41	48	240	50	8	560

*Nearly half the students in the Faculty of Arts groups are *Honour Students* in History, Commerce, Social Science, etc.

‡A course in Military Topography given to Second Year students in Military Science

†A special course in Climatology to extra-mural students

In June 1940, after a number of Committee meetings, the arrangements for an Honour course were drawn up and assented to by the necessary authority. It was decided that our Honour students should attend the common First Year for Honour Science. This course acquaints the students with the elements of Chemistry, Physics and Biology, but very little Geology and no Geography are at present included. In addition, an alternative form of entry was made possible, whereby a Pass student who obtained a high standard in Pass Geography

in his first year could transfer to second year *Honour Geography*.

The Honour student now takes Geography for twelve hours a week in second, third and fourth years (in place of the four hours taken by the Pass Student). He also attends a total of about ten hours a week in three of the following departments:—Geology, Physics, Anthropology, Botany, Economics, History, and Mineralogy, during each of his three later years.

In the Second Year Honours, his geographical work comprises certain introductory lectures in

Physical, Mathematical and Canadian Geography, as well as the lectures in the subject given to the First and Second Year Pass students. Third and

Fourth Year students attend the following courses in alternate years A and B. These vary in length from one to three hours a week through the year.

Honour Courses	A — (Third and Fourth years)	B — (Third and Fourth years)
Dr. Taylor	North America (West) Polar Regions, Climatology	Australia, Urban Geography
Dr. Tatham	North America (East), Asia	Europe, History of Geography
Dr. Putnam	Latin America, Pedology	Africa, Agricultural Geography

Post-graduate work is assuming considerable importance in the young department. During the year just closing we have four students working for the M.A. There are also two Chinese graduates with scholarships from the Chinese Government, who are attending lectures and carrying on research with a view to obtaining the Ph.D. in a few years. Research theses form part of all these programmes, and various city and regional studies are being produced. Special mention may be made of the study of the *Evolution of Toronto* by Miss N. Hooper, B.A., which has been materially assisted by a Studentship given by The Canadian Geographical Society. The staff has carried on a good deal of research, much of it naturally dealing with Canada. In the past six years, five books and about twenty-five scientific papers have been published, in spite of the rather onerous duties involved in building up a new and rapidly growing university department.

Two further aspects of our work may be briefly discussed. It seems lamentable that school geography in Canada should be at a lower level than it was in the sister dominion of Australia forty years ago. Before 1900, the schools in the southern continent gave adequate preparation for what we may call Matriculation Geography. Many hundreds of scholars took this public examination each year in Sydney, Melbourne and other large towns. There is no good reason (now that many teachers are available) why we should not have Matriculation Geography taught in our Ontario schools within a very few years. I need not stress the necessity for young Canadians to learn something of the relation between the resources and present and future settlement in the Dominion. As I have stated repeatedly, when the three R's are completed, then history, geography and some biology should be the foundation subjects of every one's education. These should take precedence of mathematics or science. Only in a few ultra-conservative countries like Canada is geography still crowded out by

school classics. How can an imperfect knowledge of Latin and Greek help our youth to face the problems of this rapidly contracting world? It should be obvious that no school subject is so helpful as modern geography in this connection.

Lastly, what can we offer the graduate in Geography as a reward for his labours? I have already pointed out the vast need for more trained school teachers. In the Canadian Universities there is no independent department except at Toronto. There are valuable lectures in the subject given at Vancouver, London, Hamilton, Kingston and Montreal, and each of these institutions might well establish an independent department. Judging by British and American experience and populations, we should have some forty full-time University teachers (instead of five or six) in the Dominion.

Our Dominion Civil Service could use geographers, as already is done on a large scale in England and the States, and on a small scale in Australia. At Sydney my Department received six Cadets each year who were being trained for administrative posts in New Guinea. Why should not the same procedure benefit the development of the empty North of Canada? In the United States the Tennessee Valley Authority employs about fifteen Doctors of Geography, many of them trained in my old university at Chicago. In statistics, in diplomacy, in soil surveys, in social planning, in forestry, in the Weather Service, and in journalism are many positions where the training in deduction and in the collecting, charting and interpreting of data (the special work of geographers) would be found invaluable. In the military field a knowledge of the principles determining the various topographies, land and water routes, distribution of oil, coal, iron, etc. is of major importance. Yet I think the greatest value of all is that our discipline fulfils the behest of that great teacher Aristotle: "The aim of education should be to train our youth to understand their relation to the world they live in".

*See the impartial article by Professor G. Norwood (Latin) in *University of Toronto Quarterly*, July 1940

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The Society's ambition is to make itself a real force in advancing geographical knowledge, and in disseminating information on the geography, resources and people of Canada. In short, its aim is to make Canada better known to Canadians and to the rest of the world.

As one of its major activities in carrying out its purpose, the Society publishes a monthly magazine, the Canadian Geographical Journal, which is devoted to every phase of geography—historical, physical and economic—first of Canada, then of the British Empire and of the other parts of the world in which Canada has special interest. It is the intention to publish articles in this magazine that will be popular in character, easily read, well illustrated and educational to the young, as well as informative to the adult.

The Canadian Geographical Journal will be sent to each member of the Society in good standing. Membership in the Society is open to any one interested in geographical matters. The annual fee for membership is three dollars in Canada.

The Society has no political or other sectional associations, and is responsible only to its members. All money received is used in producing the Canadian Geographical Journal and in carrying on such other activities for the advancement of geographical knowledge as funds of the Society may permit.

EDITOR'S NOTE-BOOK

Donald W. Buchanan, author of "Defence Outpost for North America", draws on his recent personal experience of many months engaged with the censorship control station in Bermuda to present an article of general topical interest at this time, exemplifying the co-operative effort between Great Britain and the United States. Born in Lethbridge, Alberta, and a graduate of the University of Toronto and Oxford University, with years of experience as journalist and art critic behind him, the writer is the author of the biography "James Wilson Morrice, Canadian Painter and Nomad".

Edgar Houldsworth, contributor of "The Big Muddy Valley of Southern Saskatchewan" is a native of the West Riding of Yorkshire, England. He spent the greater part of his life in London, where he attended the Central Foundation School; later studying for the Civil Service at King's College where he acquired his knowledge of geology. After three years in the Civil Service, he came to Canada, and his article presents the fruits of several years' research in a section of Saskatchewan at present little known.

Ralph Purser who writes on "Cheese as a War-time Necessity" in this issue is a journalist of wide experience. He has specialized in agricultural subjects and presents a clear concise picture of a topic on which readers will welcome illumination.

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AMONGST THE NEW BOOKS

The Prodigious Caribbean, Columbus to Roosevelt, by ROSITA FORBES, (Toronto: Cassell, 1940 15/). Zest for adventure has led Rosita Forbes to many far away places. In the islands of the Caribbean, so beautiful and so rich in legendary charm, she had found a theme which gives full play to her powers of description, her ingenious interpretations of their history, and to her ironic and epigrammatic linking of past and present ages of the world. She constantly startles one with telling analogies between Columbus and Hitler, between the stormy days of the buccaneers and the unparalleled barbarism which has shocked the world of to-day. "Columbus' inspiration to convert 'such great peoples' passed as quickly as Hitler's desire to have only his own race within the Reich. When the 'Führer' said in June 1933: 'We Germans can be content with very little but we must have something', Columbus wrote, 'It would be enough to propagate the Christian religion'. But the ideas of both were changed with success on a scale they had visualized but never really believed".

In her study of Columbus' four voyages to the New World, the author shows this "pedlar of visions" going to and fro between Spain and Portugal in desperate endeavours to win support for his enterprise, and succeeding, only to have his great gifts as Admiral nullified by his complete failure in the arts of government and in the colonization of the islands he so assiduously collected. We see the inevitable deterioration of his character, which at first seemed that of an ardent Christian Knight setting forth on his first voyage to found a second Jerusalem for the sake of rescuing the first, but gradually swayed by greed of pelf and power to his own ruin.

Salvador de Mandariaga, to whom the book is dedicated, strongly supported the idea that Cristobal Colon, to give him his Spanish name, was a Jew, and on this theory the author works out a very dramatic and intriguing history. If occasionally this aspect is over-emphasized it seems to add to Mrs. Forbes' exciting and vivid pictures of that great age of discovery, the "heyday" of Portugal and Spain.

"These islands have too much history. Too many nationalities have set their mark upon them." Great as was the day when Columbus set foot on San Salvador it yet brought the beginning of innumerable wars. Thus, in the third part of her fascinating book, the author proceeds to relate the tempestuous history of Cuba, Haiti, Jamaica and

(Continued on page VIII)



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(Continued from page VI)

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the Bahamas. She says: "Washington's new naval bases stretching from Bermuda to Guiana will protect the stormiest seas in the world. For four hundred years the hurricanes have been imperial and religious, national, racial and psychological as well as climatic. Great issues were decided under fire — by Columbus and the men who followed him; de Soto; Morgan, the wickedest man in history; Raleigh and stout old Benbow, fighting one against twenty; the amazing Dutchmen, de Graff and Van Horn; France's great Viceroy, d'Ogéron; the negro emperor, Christopher; and Toussaint, the preposterous Liberator", and she prophesies, "The American age has yet to begin. It was predicted when Columbus imagined a narrow cut joining the oceans east and west and when Drake realized that 'from the waist of the world' a Great Power could hold the Pacific and Atlantic. So the Viceroyalty of 'seas, islands, oceans and mainland' whose prodigious wealth is as important to the socialism of the future as to the tyrannies of ancient Spain and western Germany goes to the people whom Columbus visualized as 'dying only when they were weary of living'."

Part four gives the author's impressions of present-day conditions, in informative and entertaining chapters, devoted in turn to the Bahamas, "last fragments of Eden", Jamaica, Cuba, Puerto Rico, Haiti, "negro heaven", and Trinidad, Curacao and Panama, the last under the title, "Oil and High Admiralty in the Caribbean". The book, which has a map and a good index, is illustrated by nineteen attractive photographs.


The Lure of Quebec, by W. P. PERCIVAL (Toronto: Ryerson Press, 1941, \$2.50). Few cities in the new world have such a power as Quebec possesses to awaken the historic sense. In spite of modern developments, particularly its excellent harbour facilities, one's most vivid impression is of a French civilization in an old-world setting. Visitors, enchanted by the magnificent panorama to be seen from its famous Terrace, and meeting at every turn memorials of bygone days, eagerly seek a guide book which will answer the innumerable questions that arise in their minds as they tread its steep streets and wander over its heights.

Dr. Percival, Director of Protestant education for the Province of Quebec, from his long residence in the city and his intensive study of its history, is eminently fitted to write this comprehensive and

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VIII Kindly mention CANADIAN GEOGRAPHICAL JOURNAL when replying to Advertisements



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(Continued from page VIII)

fascinating guide. As we follow him in the skilfully arranged tours through the city itself and the many lovely surroundings, we relive its history, and, in imagination, mingle with a motley crowd "of French aristocrats and seigneurs, proud churchmen and priestly explorers, saintly women, quaint *coureurs de bois*, silent Indians and many common people, for all have lived and moved in the narrow streets and timeworn dwellings of this venerable city".

The arrangement of the book is such that it can be used directly. The tourist should carry it around with him. The tours are planned in series, and the enquirer can read the descriptions at every stop. Better still to read it beforehand, pondering especially Colonel Wood's foreword in which he enumerates the many features and events which make Quebec unique not only in Canada but in North America. Delightful illustrations from photographs and old prints and engravings, a clear plan of the city, an adequate index and a short bibliography add to the book's interest and usefulness.

Living Treasure, by IVAN T. SANDERSON (Toronto, MacMillan, 1941, \$4.25). "My wife and I are irrepressibly interested in natural history and this pursuit happens also to be our profession. The author objects to having his journeys in search of certain rare animals described as expeditions. His object is "merely to state as clearly and truthfully as possible the life of and the life in the tropical forests and jungles". One result of Mr. Sanderson's field studies in 1932-1933 in the British Cameroons, West Africa, was *Animal Treasure*, an unusual and exciting book of natural history exploration. His ardent interest in exotic animals and keen appreciation of the oddities of native life, combined with close observation, based on exact zoological knowledge, and a gift for portraying the flora and fauna in striking and beautiful drawings make his books a delight to the eye and the mind.

His second book *Caribbean Treasure* recounted a later expedition fruitful in natural history research, to be followed by the present volume, where we find the author, his wife and his versatile assistant "Fred", pursuing their earnest yet rollicking way in Jamaica, British Honduras and Yucatan. Their adventures and experiences as they search for treasure, varying from rare parasites in the ears of a bat, to pumas and crocodiles, are told with gusto, humour and enthusiastic appreciation of the job on hand that is irresistible. Sanderson, in this

volume, shows the reader a little more of the underlying purposes that guide his work, "the plotting of evolutionary graphs, the correlation of habitat to species and types, the investigation of so-called civilized diseases among completely wild animals". To some readers the incidents, startling, dangerous and often ludicrous, that befall him and his fellow-workers will perhaps have the strongest appeal. They certainly lose nothing in the telling.

Cambridge, as it was and as it is to-day, by JOHN STEEGMAN, (London, Batsford, 1940, 10/6 net). In this copiously illustrated book we have a guide to the University and its buildings and a fascinating history of town and gown life from the twelfth century to the present. The author describes in turn the Cambridge of Medieval, Reformation, Seventeenth Century, Georgian and Victorian times. In Part 2, Cambridge as it is, the surviving buildings and institutions of each period are examined and criticized with a delightful mingling of architectural knowledge, and stories of "prophets, priests and kings", who move in and out of the picture in sharp characterization and who influence its history as strongly, perhaps, as its college heads and benefactors. Penetrating comparisons between the two ancient universities are frequently encountered, from which Cambridge emerges often with some special glory or appeal.

After discussing in Part 3, Modern Cambridge, its social, athletic and learned world, its later architecture and its astonishing development in the realms of music and science, Mr. Steegman deals faithfully with modern architecture in Cambridge and concludes with a thoughtful chapter on Cambridge of the future.

"There will still be people a century hence who prefer a quiet and contemplative stream to a river at whose end are the rich prizes of commerce; and there will still be men who prefer undisturbed research and the quiet interchange of thought to the striving after such prizes . . . The Cam will continue to flow slowly and the lawns by its banks will continue to be mown: young men will continue to lean over the small steep bridges by moonlight and learn more from the outline of Clare or the Trinity Library than ever Lord Rutherford could teach them. No young man can be deeply moved by the Cavendish Laboratory but even a biochemist can be moved by the old bridge at John's or evening service in the winter term at King's . . ."

F. E. FORSEY

Focus on Africa by RICHARD UPJOHN LIGHT, (American Geographical Society, New York, 1941)

This volume is the twenty-fifth immensely interesting and informative special publication issued by the American Geographical Society. The author, Dr. Light, is a physician who has taken an intense interest in aviation. Among his numerous flights he made a complete circuit of the globe by plane, with the exception of the part from Vancouver to Manila.

In his book he tells of his flight across Africa, and the story is supplemented by pictorial records taken by his wife. The story of this flight makes interesting reading, either as a travel book, a geographic study, or as pure adventure according to the interest of the reader. The geographical facts are introduced in a pleasing manner, free from all the flamboyant recently-coined technical terms which clutter up some of the articles on geography.

The views and the text describe some of the terrible soil erosion taking place in many areas, a description is given of equatorial mountains capped with snow; rift valleys and groups of giant craters; the Nile and its headwaters, diamond and gold mines; elephants and hippopotami; zebras, gazelles and lions.

The political aspects and subdivisions of Africa with their historical background are succinctly described; the conditions of the blacks and whites on ranch and in settlements; the struggle of the people to adapt themselves to rapidly changing conditions; over grazing, poor farming; destructive grass fires; and overpopulation. The author also draws attention to the unsolved problems of Africa such as — the tsetse fly, malaria, and the declining returns of soil capital.

Africa has been exploited by the whites. It does not contain illimitable resources, but is one of the tests of the "white man's 'civilizing' power, a challenge to put into long-range and humane synthesis the terrible resources of his will and science". Africa presents one of the major problems of the present century, and a suggestion of many of these problems is obtained from a study of this excellent book.

The Voyageur's Highway — Minnesota's Border Lake Land by GRACE LEE LUTE, Curator of Manuscripts, Minnesota Historical Society, St. Paul, Minn. Price: \$50.

To all the individuals who have contributed to the production of this delightful volume, readers will be very grateful. Frank Brooks Huckaback, a Chicago lawyer, became so intensely interested in the area where he has spent many years of travel,



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wishing to interest the casual visitor to the Superior-Quetico region in its unique and colourful history, persuaded the Minnesota Historical Society to undertake the publication of the volume, and assisted materially in time, money and enthusiastic supervision.

The Society was fortunate in having Grace Lee Nute undertake the writing of the book. As Curator of Manuscripts for the Society she had access to authentic documents, and after paddling and portaging over the routes taken by the old voyageurs, famous in the days of exploration and fur-trading, she has been thoroughly saturated with the lore of the Minnesota Northlands, and presents her story in a fascinating style. Voyageurs, Indians, fur-traders, timber cruisers, lumber jacks, surveyors and fishermen people the ancient waterways, all placed in a background of physical features charmingly described.

A chronological table at the end of the book gives a condensed summary of historical events. The cover design is a work of art.

The Minnesota Historical Society deserves great credit for presenting such a picture of the Border Lake region of the State.

D. A. NICHOLS

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To Members

MAKING "TO-MORROW'S ACTION" — TO-DAY'S "GOOD DEED"

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(Continued from page XI)

Kabloona by GONTRAN DE PONCINS, in collaboration with LEWIS GALANTIERE. (Reynal & Hitchcock, Inc., New York & Toronto, 1941, pp. 339, illustrated by sketches and photographs by the author. Price \$3.75).

Kabloona ("White Man") is not so much an account of the life and the land of some of the most primitive and inaccessible Eskimo tribes of arctic North America as it is an account of how a highly observant and cultured white man sees these people, who for the first time goes to their country and tries to live their life amongst them, not as a Government official, not as a missionary or as a member of a well-equipped, modern expedition, but as a lone, unassuming and very inexperienced "Kabloona" who has few trade goods to offer in exchange for services and who for long periods must depend upon the hospitality and goodwill of his Eskimo hosts.

Like so many young men of the post-war era, de Poncins was temporarily "fed up" with civilization and went North in search of primitive peoples. "My concern in this book", de Poncins says, "is not primarily with my own wanderings or state of mind. My concern is with the Eskimo, with his life and traits, his broodings and ruminations, his invincible serenity in the face of the hardest physical existence lived by man anywhere upon earth." In this he succeeded remarkably well although at first the fastidious taste and habit of the Parisian Frenchman were repulsed by Eskimos' apparent lack of cleanliness, and their carefree and seemingly irresponsible way of life annoyed him immensely. But in less than a year he found himself almost unconsciously accepting the philosophical way in which the Eskimos regard dirt, food and body functions; and everything that did not in some way serve in the struggle for life, against a hostile and unfriendly nature became inconsequential. He began to see that beneath what at first had seemed squalor, gluttony and coarseness appeared a naive and child-like, but, at the same time, very likeable and deeply human, cheerful and hospitable race.

De Poncins had had plenty of experience with primitive peoples in other lands, particularly with those of the French Colonies, but never with Eskimos. He understood or spoke no Eskimo and he journeyed north to the shores of the "Glacial Ocean" with an open mind, unbiased by the opinions expressed by those who had gone before him. Many others have done what de Poncins did, but few, if any, have had the ability to record what he saw in the highly artistic and beautiful style of *Kabloona*.

When, many years ago, Jenness let himself become adopted into a family of the then still unsophisticated Coronation Gulf Eskimos, he did it in order to observe and record things that no ethnologist would otherwise see and record. Also, Jenness remained long enough to completely master

the difficult language, but even in his popular and delightful book *People of the Twilight* he is the truly scientific, though very understanding observer, who constantly keeps himself in the background and, so to speak, lets the Eskimos tell the story of their own life. Rasmussen, on the other hand, who, perhaps better than any one else, has been able to interpret the thoughts and the minds of Eskimos, was himself enough Eskimo to be accepted as one of the "Inuit People".

De Poncins' *Kabloona* is thus the very antithesis to most books written about the Eskimos. Its author does not claim to be a scientist or to have written a scientific treatise on the people of King William Island and Pelly Bay, he claims no geographical discoveries and he propounds no new theories, but in *Kabloona* he does succeed in drawing a masterly picture of the Arctic and its people seen through the eyes of a white man.

His account of the life and conversations of two white men accidentally thrown together in a remote and lonesome trading post is masterly, as is the story of Father Henry, the saint-like Catholic priest of Pelly Bay, who for years has lived as a hermit in a hole dug into the frozen earth without heat and without any kind of white man's food.

The book is well written and the style delightful. Altogether one of the most readable of the many books written about the "Inuit People".

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